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CONTENTS

FIRST PART: ORIGINAL ARTICLES.

ALL, H. S. The Present Status of the Cattle Industry in Canada	Page 1255
ALLA, ORESTE. The Crisis in Italian Sericulture and the Measures for Avert-	
ing It.	" 1263

SECOND PART: ABSTRACTS.

AGRICULTURAL INTELLIGENCE.

I. — GENERAL INFORMATION.

- DEVELOPMENT OF AGRICULTURE IN DIFFERENT COUNTRIES. — 870. Agriculture in Sweden.
1. HYGIENE. — 871. Control of Beri-Beri: Curative Action of Autolysed Yeast against African Polyneuritis. — 872. American Black Flies.
- CULTURAL EDUCATION. — 873. Agricultural Schools in Panama.
- UTILIZATION OF EXPERIMENTAL AND ANALYTICAL WORK. — 874. The Experiment Farm at Genale, Italian Somaliland.
- CULTURAL INSTITUTIONS. — 875. Reorganization of the Experimental Garden at Hamma, near Algiers.

II. — CROPS AND CULTIVATION.

a) GENERAL

- PHYSICS, CHEMISTRY AND MICROBIOLOGY. — 876. A New Method of Determining the Density and Porosity of Soil and Rocks. — 877. A New Method for the Determination of Soil Acidity.
- RECENT IMPROVEMENTS. DRAINAGE AND IRRIGATION. — 878. The Ombroline Diversion for the Reclamation of the Plain of Grosseto, Italy.
- FERTILISERS AND MANURING. — 879. The Composition and Value of Bat Guano. — 880. The Solubility of the Various Constituents of Basic Slag. — 881. Measures for Meeting the Shortage of Potash Salts in Great Britain.

b) SPECIAL

- CULTURAL BOTANY, CHEMISTRY AND PHYSIOLOGY OF PLANTS. — 882. Coloration of the Seed Coat of Cowpeas. — 883. Palms Indigenous to Cuba. — 884. Influence of Pressure on the Structure of Roots. — 885. The Aroma of Hops: Studies of the Essential Oil and

- its relation to Geographic Distribution of Hops. — 886. Fenugreek Seeds. — 887. Assimilation of Atmospheric Nitrogen by Plants. — 888. Physiological Researches on the Germination of the Pollen of *Vitis vinifera*.
- PLANT BREEDING. — 889. Thirteen Years of Wheat Selection. — 890. Note on the Selection of Maize in Cambodia.
- AGRICULTURAL SEEDS. — 891. Innovation in the Danish Trade in Seeds of Root Crops. — 892. Longevity of Some Common Seeds.
- CEREAL AND PULSE CROPS. — 893. Influence of External Physical Agents on the Germination of Wheat.
- FORAGE CROPS, MEADOWS AND PASTURES. — 894. Studies on the Pollination of Lucerne and its Relation to Seed Production. — 895. Alfalfa in the United States.
- CROPS YIELDING OILS, DYES AND TANNINS. — 896. Methods of Propagation of Olives. — 897. Olive Growing in Syria. — 898. Olive Growing in the District of Tizi-Ouzou, Algeria. — 899. The *Aleurites* of Tonking.
- SUGAR CROPS. — 900. Cultivation of the Sugarcane in the South of Spain. — 901. Sugar Experiments in Ireland.
- STIMULANT, AROMATIC, NARCOTIC AND MEDICINAL CROPS. — 902. *Coffea excelsa* and its Cultivation. — 903. Studies on the Fertilization of Hops. — 904. Essential Oil of *Ocimum*. — 905. Medicinal Plants in Tunis.
- VARIOUS CROPS. — 906. A New Cover Crop: *Dolichos Hosi*. — 907. Studies on the Composition of Mulberry Trees in Japan.
- FRUIT GROWING. — 908. Cultivation of European Fruit Trees in Tonking. — 909. Propagation of the Date Palm. — 910. Date Palms from Irak. — 911. New Fruits on North American Markets. — 912. Influence of Chemical Manures on the Keeping Qualities of Peas. — 913. *Fremocitrus*, a New Genus of Citrus Trees from Australia. — 914. Hybrid Direct Bear in the Côtes-du-Rhône District, France, in 1913.
- FORESTRY. — 915. The Alpine Limits of Forest Growth.

III. — LIVE STOCK AND BREEDING.

a) GENERAL

- HYGIENE. — 916. Studies on the Toxicity of Cicuta or Water Hemlock. — 917. Experimental Investigations into the Cause of Pernicious Anaemia or Typhoid Anaemia in Horses. — 918. Microphyllaria in Horses affected by Haemorrhagical Boils. — 919. Effect of Local Temperatures on the Bacilli of Anthrax. — 920. Vaccination against Hog Cholera.
- ANATOMY AND PHYSIOLOGY: GENERALITIES. — 921. Influence of Food Poor in Lime on the Composition of Growing Bones.
- FEEDS AND FEEDING. — 922. Investigations into Factors affecting the Handling of Wet Hay, including a Study of its Digestibility. — 923. Bacteriological Research on Feeding Forage. — 924. Live Stock Feeding Experiments in Ireland, 1912-13.
- BREEDING. — 925. Preliminary Notes on the Heredity of Certain Characters in a Cross between Silky and Yokohama Fowls. — 926. Studies on Inheritance in Pigeons: Hereditary Mutations of the Principal Colours.
- STOCK-RAISING: ORGANIZATION AND ENCOURAGEMENT. — 927. Animal Husbandry in Sarawak.

b) SPECIAL.

- CATTLE. — 928. Report of the Dickinson County Cow-testing Association.
- SHEEP. — 929. Breeding of Karakul Sheep in the United States.
- GOATS. — 930. The Age of Goats according to their Teeth.
- REINDEER. — 931. Rearing Reindeer in Alaska.
- POULTRY. — 932. Winter Egg Records in Ireland. — 933. Attempts at Breeding the Great White Heron and the Buff-backed Heron in Madagascar.

CONTENTS

v

934. New Research on the Visual Power of Bees. — 935. Apiculture in Ireland. — 936. Collection and Exportation of the Wax of Wild Bees in the African Colonies.

IV. — FARM ENGINEERING.

- CULTURAL MACHINERY AND IMPLEMENTS. — 937. Stump Burning to Reclaim Logged-off Lands. — 938. The Garrett-Crawley Agrimotor. — 939. The "Welsh" Bracken Cutter. — 940. The Articulated Yoke. — 941. Review of Patents.
DING CONSTRUCTION. — 942. Pig Stye with Device for Protecting and Warming Sucking Pigs.

V. — RURAL ECONOMICS.

- Book-keeping Statistics on the Profitableness of Bee-keeping in Switzerland.

VI. — AGRICULTURAL INDUSTRIES.

- INDUSTRIES DEPENDING ON PLANT PRODUCTS. — 944. Wine Making without Refrigeration in Warm Countries. — 945. Refrigeration in Wine Making. — 946. A New Method of Making Wine and of Utilizing the Pomace. — 947. Determination of the Tartaric Acid in Wines by Physico-Chemical Volumetric Analysis.

- INDUSTRIES DEPENDING ON ANIMAL PRODUCTS. — 948. Ratio between Specific Gravity and Fat and Dry Matter in Cow's Milk. — 949. An Investigation into the Composition of Cheese made from Whole Milk. — 950. On the Characteristic Flavour of Roquefort Cheese.

PLANT DISEASES.

II. — DISEASES NOT DUE TO PARASITES AND OF UNKNOWN ORIGIN.

- Withering of the Panicle in Rice.

III. — BACTERIAL AND FUNGOID DISEASES.

- PEAR. — 952. Status of Investigational Work on Pear and Apple Blight.

- PEE. — 953. Observations on the Life-History of the American Gooseberry Mildew (*Sphaeria mors-uvae*).

- WAYS OF PREVENTION AND CONTROL. — 954. Burgundy Mixture.

- BACTERIAL AND FUNGOID DISEASES OF VARIOUS CROPS. — 955. A New *Botrytis* on Flowers of Red Clover in Russia. — 956. Potato Diseases in Great Britain. — 957. Celery Leaf-spot Disease (*Septoria Petroselinii* var. *Aptii*) in England. — 958. Black Rot of Grapes (*Gnopharia Bidwellii*) in Spain. — 959. Contribution to our Knowledge of Apple Scab. — 960. Rotting of Pomegranates in India: *Sterigmatocystis castanea*. — 961. Bud-rot of Coconut Palms (*Pythium palmivorum*) in Malabar. — 962. Wood-destroying Fungi which grow on both Coniferous and Deciduous Trees.

IV. — PARASITIC AND OTHER INJURIOUS FLOWERING PLANTS.

- Verbena Rhoeas* and *P. hybridum*, Common Weeds in Egypt.

V. — INSECT PESTS

GENERALITIES. — 964. Notes on the Biology of Leather Jackets (*Tipula oleracea*) in the Pays of the Avesnois (Nord, France). — 965. Observations on the Life-History of the 1st Aphis (*Aphis euonymi*). — 966. Emergence from the Soil of the First Larvae of *Phylla vastatrix* in Italy. — 967. Notes on *Aspidiotus brometiae*. — 968. Life-History of the Leaf-Beetle (*Galerucella sulcata*).

MEANS OF PREVENTION AND CONTROL. — 969. Winter Precautions against the Pupae of 1 Moths (*Ctenychis ambigua* and *Polychrosis botrana*). — 970. Fumigation of Citrus 1 in Egypt.

INSECTS INJURIOUS TO VARIOUS CROPS. — 971. Principal Pests of Rice in Indo-China 972. Mole Crickets (*Gryllotalpa vulgaris*) damaging Rice Field in Italy. — 973. *Sten* tato Sphinx (*Herse consocii*?) in Natal. — 974. Large Narcissus Fly (*Moradon squ* and Small Narcissus Fly (*Eumerus strigatus*) injurious to Bulbs in Great Britain and 1c

FIRST PART.
ORIGINAL ARTICLES

The Present Status of the Cattle Industry in Canada

by

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According to the last Dominion Census held in 1911, there were in Canada at that time 6 533 436 cattle. The following table indicates how they are distributed by provinces as well as the comparative increase which has taken place during the last 40 years.

An examination of the above statistics, while making clear that there has been a regular and reasonable increase during the past fifty years in the cattle population of the country, reveals a somewhat anomalous situation as regards the proportionate development of the Eastern and Western halves of the Dominion. In Eastern Canada, production has barely held its own and particularly in the provinces of New Brunswick and Nova Scotia there has been a distinct falling off during the past two decades. On the other hand, Western Canada, including the prairie provinces and British Columbia, has made definite and satisfactory advancement.

The conditions causing this situation are not far to seek. The lure of free land has turned the tide of settlement westward, the movement of population being not only from across the Atlantic but as well from the coastal districts of the Maritime provinces, Quebec and Ontario. The redistribution of population, following the opening for settlement of the extensive and fertile areas in the provinces west of the Great Lakes has had a very important bearing upon the development of the live stock industry.

A further feature, pertaining to the relative growth of urban and rural populations, should also be alluded to in this same connection. There has been, during the past ten years, in every province of Eastern Canada, with the exception of Quebec, a decrease in the rural population, while,

	1871	1881	1891	1901	1911
<i>Prince Edward Island.</i>					
Milch Cows	—	45 895	45 849	56 437	52 464
Other Cattle	—	44 827	45 846	56 342	56 464
Totals	—	90 722	91 695	112 779	108 928
<i>Nova Scotia.</i>					
Milch Cows	122 688	137 639	141 684	138 817	126 500
Other Cattle	151 279	187 964	183 088	177 357	155 100
Totals	273 967	325 603	324 772	316 174	281 600
<i>New Brunswick.</i>					
Milch Cows	83 220	103 965	106 649	111 084	105 100
Other Cattle	80 467	108 595	98 043	116 112	112 100
Totals	163 687	212 560	204 692	227 196	217 200
<i>Quebec.</i>					
Milch Cows	406 542	490 977	549 544	767 825	753 100
Other Cattle	376 920	539 356	419 768	598 044	590 100
Totals	783 462	1 030 333	969 312	1 365 869	1 343 200
<i>Ontario.</i>					
Milch Cows	638 759	782 243	876 167	1 065 763	1 034 100
Other Cattle	764 415	919 924	1 064 506	1 422 041	1 471 100
Totals	1 403 174	1 702 167	1 940 673	2 487 806	2 505 200
<i>Manitoba.</i>					
Milch Cows	—	20 355	82 712	141 481	151 100
Other Cattle	—	39 926	147 984	208 405	270 100
Totals	—	60 281	230 696	349 886	421 200
<i>Saskatchewan.</i>					
Milch Cows	—	—	—	—	181 100
Other Cattle	—	—	—	—	452 100
Totals	—	—	—	—	633 200
<i>North-West Territory.</i>					
Milch Cows	—	3 848	37 003	56 634	—
Other Cattle	—	9 024	194 824	212 145	—
Totals	—	12 872	231 827	268 779	—
<i>Alberta.</i>					
Milch Cows	—	—	—	46 101	147 100
Other Cattle	—	—	—	276 859	592 100
Totals	—	—	—	322 960	739 200
<i>British Columbia.</i>					
Milch Cows	—	10 878	17 504	24 535	31 100
Other Cattle	—	69 573	109 415	100 467	105 100
Totals	—	80 451	126 919	125 002	136 200
<i>Dominion of Canada.</i>					
Milch Cows	1 251 209	1 595 800	1 857 112	2 408 677	2 394 100
Other Cattle	1 373 081	1 919 189	2 263 474	3 167 774	3 019 100
Totals	2 624 290	3 514 989	4 120 586	5 576 451	5 413 200

the same period, there has been a significant increase in the urban population. In Western Canada, however, there has been an increase in population in both rural and urban districts. The following table will show considerable interest in making clear this comparison.

Rural and Urban population of Canada in 1911 and 1901 by Provinces and the Increase in the decade.

Provinces	Population 1911		Population 1901		Increase	
	Rural	Urban	Rural	Urban	Rural	Urban
Canada total . .	3 925 502	3 281 141	3 349 516	2 021 799	+ 575 986	+ 1 259 342
Alberta	232 726	141 937	52 399	20 623	+ 180 327	+ 121 314
British Columbia .	188 796	203 684	88 478	90 179	+ 100 318	+ 113 505
Manitoba	255 249	200 365	184 738	70 473	+ 70 511	+ 129 892
New Brunswick . .	252 342	99 547	253 835	77 285	- 1 493	+ 22 262
Ontario	306 210	186 128	330 191	129 383	- 23 981	+ 56 745
Quebec	1 194 785	1 328 489	1 246 969	935 978	- 52 184	+ 392 511
Prince Edward I. .	78 758	14 970	88 304	14 955	- 9 546	+ 15
Saskatchewan . . .	1 032 441	970 791	992 667	656 231	+ 39 774	+ 314 560
Manitoba	361 067	131 365	73 729	17 550	+ 287 338	+ 113 815
Manitoba	4 647	3 865	18 077	9 142	- 13 430	+ 5 277
Northwest Territo-	18 481	---	20 129	---	- 2 933	---

The table given above throws considerable light upon the relation existing between supply and demand with respect to the marketing of meat products in the Dominion. Reason is presented for the fact that during the past decade exports have fallen off and imports have increased, while in the past three or four years prices have advanced at an unprecedented rate. It now becomes clear that while the consuming centres have been extending in area and increasing in population, the producing areas have become depleted in population and potentially, for the present at least, not largely increased in extent. In explanation of this latter statement it should be remembered that, hitherto, grain growing and not stock raising has been the most prominent feature incident to the agricultural development of Western Canada and that the increase in the rural population of that part of the country has thus far resulted in an increased output of wheat, oats, barley and flax rather than in an appreciable extension of stock-breeding operations. Moreover, the influx of settlers has gradually entailed a systematic reduction of the prairie pasture and range areas, with a corresponding curtailment in the rearing of cattle under range conditions. Much of the land, therefore, which was formerly

devoted to cattle raising has, during recent years, been placed under cultivation and, in consequence, is not now producing its one-time quota of marketable animals. Mixed farming is, however, now rapidly gaining ground in Western Canada, particularly in the more northerly portion of the three prairie provinces, and this accounts for the fact that, despite the reduction in the range areas, the West has been able of late to appreciably increase its cattle stock. It would seem that a considerable extension of this movement may be confidently expected within the next few years there having been already established there the foundations of a great cattle industry.

As casting additional light upon the present relative demand and supply of beef and beef products, reference should now be made to the changes which have taken place in our export and import trade during the past few years. The following table furnishes a great deal of useful information in this connection.

Canadian exports and imports of cattle and beef.

Year	Export cattle trade		Import cattle trade	
	Cattle Number	Beef Lbs.	Cattle Number	Beef Lbs.
1883	66 396	628 728	20 978	2 761 7
1893	107 224	356 106	1 851	5 599 11
1903	176 780	2 378 175	37 528	1 361 19
1909	162 945	1 571 585	2 601	1 306 82
1910	157 386	1 318 397	1 012	1 446 39
1911	124 923	974 411	3 044	1 170 64
1912	61 517	948 771	2 976	1 976 49
1913 (calendar yr.)	216 295	—	9 127	—

By way of comment upon the above figures it should be explained that the export trade of live cattle to the United Kingdom has practically ceased, notwithstanding the fact that this trade, for a considerable period, absorbed the best and heaviest cattle produced in either Eastern or Western Canada. The great lairages in London and Liverpool, built exclusively to handle American live cattle, now remain permanently empty. The markets of the United Kingdom have been forced to the conclusion that they can no longer draw their supplies from this continent.

As the table does not make it sufficiently clear, reference should be made, perhaps, to the peculiar situation which developed during 1913 in connection with the exportation of cattle to the United States. Practically all of the cattle exported, as credited to that year, went across the American border. Such an anomalous development, however, has been significant of only one thing; that, with the removal of the American tariff

her prices could be realized in the United States than in this country. Liquidation of Canadian stock continued until an equilibrium was reached, the movement further accentuating the already marked scarcity marketable cattle on this side of the border. Never in our statistical history have prices attained so high a figure, either for cattle on the hoof for meat in the butcher shops, as has been the case this year.

As regards prices, market returns and the movement of meat within the country, the average market returns for the past years in the case of prime butcher cattle sold in Toronto have been as follows: — In 1911, \$7.76 - \$6.10 per cwt; in 1912, \$6.92 - \$7.17 per cwt; and in 1913, \$7.94 - \$7.23 per cwt. These figures tell their own story and the facts which they suggest are fully featured in the scarcity of cattle in the country. Marketings on the whole have increased during the past few years. Particularly is this true in the case of calves, there being 112 053 head marketed in Toronto, Montreal and Winnipeg in 1909, as compared with 162 539 in 1913. It can scarcely be said, however, that the marketings of 1913 represent normal conditions, particularly in view of the large exportation to the United States.

Whereas formerly thousands upon thousands of cattle were received at the Toronto and Montreal markets for feeding and export purposes, in 1913 so few were received in 1913 did not total more than 2 239 head. The output of Alberta and Saskatchewan, which at one time went forward to Winnipeg, is now either consumed locally or, particularly in the case of Alberta, shipped into British Columbia. During the month of February 1913 one-quarter of a million pounds of beef were shipped from Ontario and one-quarter of a million pounds from Alberta to Canada's most westerly province. Even the prairie provinces are taking some supplies from Eastern Canada, partly through the importation of meat, but chiefly in the way of carloads of breeding cattle. In the latter movement British Columbia also largely participated. As regards Eastern Canada, the Maritime provinces, particularly Nova Scotia, are now drawing freely from Ontario and Quebec. Very recently their receipts ran up to nearly a million pounds a month. The larger cities have each taken their quota, but fully a quarter of the amount went direct to Sydney, North Sydney and Sydney in Cape Breton, where there are large manufactories of iron and steel.

A review of the facts already presented point to the one conclusion, that the country, owing to an inadequate supply, has been forced to a curtailment of meat consumption. That there is a remarkable shortage of meat and that there has been a decrease in the per capita consumption of meat is borne out by an analysis of the figures. Notwithstanding her large area and great agricultural resources, Canada, in so far as live stock products are concerned, has now ceased, except upon occasion, to be an exporting country and has already been compelled to import considerable quantities of foreign meat. The present situation, it must be admitted, largely consequent upon the nature of our economic development, but which causes producing it are steadily calling into being their own remedies. Everywhere throughout the country there is already on foot a comprehensive

sive movement toward the conservation of breeding stock and an extension of breeding operations. With breeding cattle in demand, with few calves going to the shambles and with a steadily growing domestic market it may confidently be predicted that we are about to enter upon a period of general progress and expansion.

Up to this point, we have chiefly comprehended in the discussion the business of beef making. Special reference should now be made to the position occupied by the business of dairying in the development of cattle husbandry in Canada. There are, particularly in the provinces east of the Great Lakes, certain well defined areas where dairying and dairy cattle have for generations been directly associated with the agricultural operations of the people. In Nova Scotia and New Brunswick the Guernsey and Jersey breeds have predominated; in Quebec, the French Canadian and Ayrshire, while in the dairy sections of Ontario, the Ayrshire and Holstein have attained the preference. In certain districts of the province mentioned, dairying has been, for many years, almost exclusively followed and it should now be pointed out that recently, particularly in the province of Ontario and in Western Canada, dairying as an industry has made very rapid progress, its development paralleling, in part at least, the increase in our urban population. Formerly the making of cheese and butter constituted the most important part of the business. Now, on the other hand, more remunerative avenues have opened up in connection with the shipment of milk to our more important towns and cities, and with the supplying of cream to the ice cream trade and for export to the United States.

It is generally admitted that the dairy cow yields a larger economic return than does the beef steer and that milk as a wholesome, nutritious food product is cheaper than meat. While, therefore, there are large areas of the Dominion suitable only for beef raising, still, the attention of the farming public both East and West is being directed to the profitable earning ability of the cow that will produce milk.

It would almost appear that the successful future of the beef industry in this country is dependent upon the ability of the breeders of pure-bred beef stock to combine in the cattle they produce the capacity for reasonable milk production, with an inherited tendency to rapid fleshing and to early maturity.

It would be of interest in an article of this kind to outline in some detail the progress and development of breeding operations in improving the type and quality of our cattle through the use of imported and home-bred pedigreed stock. The position of the Dominion, however, is now so well attested and so firmly established by the laurels won by Canadian-bred animals at International Exhibitions, where both beef and dairy breeds have been represented, as to make it scarcely worth while to dwell upon this feature of the industry. Certain of the older sections of the Dominion have long been recognized as amongst the most important and most dependable of live stock breeding grounds upon the North American Continent. Several factors have contributed to the attainment of this position. notably

amongst which in brief summary, may be mentioned: — the importation through a long period of years of carefully selected stock from the best of Great Britain; the climate and the character of the food which has developed hardiness, quality and finish; the competitive rivalry amongst breeders as encouraged by the great national and international exhibitions; the organization of district breeders' clubs, and the institution of the Canadian Record of Performance. Comment upon these factors is unnecessary except that it may be explained that the Canadian Record of Performance was initiated by the Federal Department of Agriculture in the interests of the breeders of dairy cattle and consists in the testing at reasonable intervals of the milk and butter-fat yield of cows whose names are applied therefor under the conditions laid down by the Department. This information which is rendered available by these records provides a standard for the selection, particularly of pure-bred sires, and its use is daily leading to an improvement in breeding practice.

One other factor is yet to be alluded to: It is, the nationalization of Canadian Records of pedigreed stock, which has not only made possible the systematization of our national live stock records, but has, as well, furthered and advanced in a very direct manner the business of the pure-bred breeder and the cattle industry of the country.

Until the year 1900 all the Live Stock Records in Canada were conducted by the Provincial Departments of Agriculture or by breed associations more or less provincial in character and scope. Although the most important record associations had their origin in the Province of Ontario, others of record were also established in Quebec, the North West Territories and in each of the Maritime provinces. This multiplicity of records, without uniform standards of registration, proved a source of confusion and expense to breeders and farmers and a hinderance to interprovincial and export trade. The first step taken to improve the existing situation was the passage in 1900 of an Act respecting the Incorporation of Live Stock Record Associations. Leading Record Associations promptly availed themselves of this Act and secured incorporation under Dominion charters within the next few months.

The establishing of a national system of records was the subject of discussion at many breeders' meetings up to the year 1904, when a General Convention of Live Stock Breeders from all parts of Canada was called at the instance of the Minister of Agriculture. At this Convention, committees were appointed to work out the details of a scheme providing for the nationalization of Canadian Live Stock Records, and in April of the following year another convention of delegates from each of the Live Stock Record Associations was held in Ottawa and a National Record Board established. This National Record Board is composed of representatives elected by the members of Directors of the various breed associations on the basis of two members for every 100 members or under, and one additional representative for each 500 members.

It is to these men, forming the National Record Board, that the breed associations delegate the work of carrying on the National Record Office

to their mutual advantage, but with due regard to the Constitution and rules of entry of each association as laid down in the Dominion charters under which it is incorporated.

The Record Board meets annually and discusses and decides larger questions connected with record matters. In order that the details of registration may be efficiently looked after, an Executive Record Committee is elected by the Board, one man representing each class of stock as follows — Heavy Horses, Light Horses, Beef Cattle, Dairy Cattle, Sheep and Swine. These representatives, presided over by the Chairman of the National Record Board, with a Secretary-Treasurer, constitute what is called the Record Committee. This Committee meets at sufficiently frequent intervals to look after the work entrusted to them by the Record Board in the matter of registration, which includes management of the National Records Office. This office is placed in charge of an Accountant, who is also Secretary-Treasurer of the Board and has full supervision of the general registrars and clerks. It will be seen that the work of registration is entirely under the control of the breeders themselves through the Breed Associations, Record Board, Record Committee, Accountant and Registrars. The Department of Agriculture, however, furnishes office accommodation and equipment, including stationery and other supplies, and assumes a further responsibility in connection with the work of the Records Office, to the extent of guaranteeing the authenticity of the certificates issued. That is to say, the registration certificates, after being prepared in accordance with the office records and carefully checked by the registrars, are handed over, along with the application forms received from the breeders, to an officer of the Department, who examines the certificates and compares them with the breeders' applications. If found correct, the certificates are approved by this officer, on behalf of the Minister, under his signature and the seal of the Department.

Regarding the disposition of fees received, they are all deposited in a bank to the credit of the association for which they are sent. The monies are payable only to the order of each representative association through its officers. It is, therefore apparent that the Record Committee, after depositing these funds through the Accountant, has no further control of them.

To finance the affairs of the office, a monthly levy is made by the Record Committee on all self-sustaining associations. The amount charged for each association is based on the charges for the previous year. If the levies prove too large or too small, adjustment is made at the end of the fiscal year. The expenses of the Associations on which levy is made are provided from a grant given by the Department of Agriculture to the Record Committee. In doing this the Department is carrying out an agreement to assist new records. The monies accruing to an association not expended as above noted, are, subject to the order of the association, to be used in meeting the expenses of officers and directors for the purposes of publicity, or in such other ways as are provided in Section 1 of the Live Stock Pedigree Act,

It may be added that the recording of live stock under the present system is found to work very satisfactorily. The methods now followed have eliminated not only the control of records by close corporations but the possibility of the occurrence of those complications inseparable from the existence of multiplicity of records in the same country. The recording of live stock is characterized by accuracy, promptness and economy of administration, while Canadian Records are now recognized as official only throughout the Dominion but in other countries as well.

With the single exception of the Canadian Holstein Friesian Association, which has a Dominion charter but has not yet seen fit to co-operate with the other Associations, all Record Associations in the Dominion are rated under the National Records System.

By way of general information with respect to the strength and standing of the various pure-bred Cattle Breeders' Associations in the Dominion, the following statement, setting forth the registrations for the year 1913 and the total membership to date, is submitted :

Name of Association	Registrations 1913	Membership 1913
Dominion Shorthorn Breeders' Association . . .	9 046	2 051
Canadian Ayrshire Breeders' " . . .	3 258	1 084
Canadian Hereford Breeders' " . . .	1 362	301
Canadian Jersey Cattle Club.	1 153	267
North American Galloway Association	23	22
Canadian Aberdeen Angus "	831	179
Canadian Guernsey Breeders' "	79	31
French Canadian Cattle Breeders' Association . .	334	172
Canadian Red Polled Association.	90	28
Holstein-Friesian Association of Canada	6 815	1 646

The Crisis in Italian Sericulture and the Measures for Averting It

by

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The production of cocoons and the silk industry are among the greatest sources of revenue of the Kingdom of Italy. The former ranges between four and eight millions sterling per annum and the latter supplies an export trade which at present amounts to about 20 millions, but which some years ago reached 28 millions. Both have very ancient traditions, for the rearing of silkworms was introduced into Calabria by the Byzantine Greeks in the

tenth or eleventh century; the Norman kings extended it to Sicily and entered the silk industry to such an extent that between the twelfth and thirteenth centuries Catanzaro, Reggio and Messina had famous factories producing velvets, brocades and other silken goods. Later, both silkworm rearing and the silk industry spread northwards and flourished there also. Indeed the chief characters of the greatest Italian historical novel — the "Promessi Sposi" of Alessandro Manzoni — are two humble silk-weavers of the year 1630. In the eighteenth and nineteenth centuries silkworm rearing and the industry connected with it continued their progress throughout the Valley of the Po (while they declined in the south of the country) and underwent a considerable increase owing to the excellence of the produce unequalled by that of any other country. The reeling, spinning and weaving of silk and the silk by-products industry, notwithstanding serious obstacles and several financial disasters, established themselves firmly, especially in Liguria, Piedmont and Lombardy; Como and Milan came to be the important centres of the silk trade as Lyons, Zurich or Crefeld. The service known in Italian as "condizionatura" or in French "passage à la condition" of silk, that is the deposit of the bales of silk in certain warehouses, whence samples are taken with a view to investigating the quality of the silk and determining the use to which the raw product is to be put, has attained and maintains in Milan much greater proportions than in the other silk centres of Europe.

These results are all the more worthy of consideration as they have been attained in spite of ever increasing difficulties, especially the fall in prices, the increase of the cost of production, and the customs' duties levied by the countries importing Italian silk fabrics. The fall in prices from 15 6d or 15 9d to less than 15 per lb. was caused by the competition of Asiatic silks, which, though much inferior to Italian silks, beat them through their lower price. Further, while the produce exported more than trebled in a quarter of a century, as the table below shows, since 1890 the wages of agricultural and industrial labour have increased by fully 50 per cent. Against the effects of this increase of cost, both the silkworm rearers and the factories opposed continued improvements in the yield and technique of their output. Lastly the silk substitutes appeared on the market: artificial silk, mercerized cotton, *viscose* and the like. Though these only take the place of silk for special purposes they contribute to reduce the demand and consumption.

The ever increasing arrivals of Chinese and Japanese silks on the European and American markets have altered the relative position of Italy in the world's market as shown by the figures in Table I. From them also it is easy to judge to what an extraordinary degree the consumption of silk has increased, notwithstanding the increased production of substitutes (1).

(1) These data have been collected by the "Union des Marchands de Soie" of Lyons and published in the *Bollettino di legislazione commerciale e doganale*, Part II, 1890, p. 62, 1903, p. 388; 1913, p. 1034.

TABLE I. — *Average yearly production of silk (in metric tons).*

Country	1885-1889	1899-1903	1907-1911	1912
.....	3 113	4 272	4 190	4 105
.....	669	599	542	505
.....	66	81	82	78
Hungary	245	300	352	294
Total Europe	4 093	5 252	5 175	4 982
and Central Asia	667	2 083	2 903	2 233
from Shanghai	2 549	4 598	3 222	6 400
Canton	1 149	2 153	2 258	2 260
Yokohama	1 928	4 309	8 124	10 867
Calcutta	553	290	261	133
Total of the whole world ..	10 939	18 685	23 943	26 915

The ratios between the figures for the period 1885-1889 and those above for 1907-11 show how the individual States have modified their

Italy	from 1 to 1.35
France	" " " 0.80
Spain	" " " 1.24
Austria-Hungary	" " " 1.43
Levant and Central Asia	" " " 4.36
Exports from:	
Shanghai	" " " 2.04
Canton	" " " 1.96
Yokohama	" " " 4.21
Calcutta	" " " 0.47

While the European and American world increased its demand for silk 2 000 metric tons, Europe contributed only about 1000 tons, the remainder 2 000 being supplied by China and Japan and forming the basis of the business and trade activity of the last decade in the Far East. Italy's contribution, which between 1885 and 1889 amounted to 28.4 per cent. of total silk, fell to 17.3 per cent. in 1907-11. According to our statistics production of fresh cocoons, which was from 38 000 to 40 000 metric tons between 1880 and 1889, reached 57 300 tons in 1900 to 1904 and in the following years fell to the following figures:

Production of cocoons in Italy from 1905 to 1913 (in metric tons).

Year	Tons	Year	Tons
05	51 940	1910	47 964
06	53 838	1911	41 951
07	57 058	1912	47 470
08	53 193	1913	38 490
09	50 260		

The prices of the raw material and of silk were in keeping with those of affairs. Up to 1875 they were high, as much as 1s 6d, 1s 9d and 2s 2d pound of cocoons, and sometimes even 36s per lb. of silk; after 1880 they varied as follows:

Periods and years	Prices at Milan, per lb. in gold			
	Fresh cocoons		Raw silk (sublime $\frac{1}{10}$ lb)	
	s	d	s	d
1880-1884	1	5	19	74
1885-1889	1	2.8	17	9
1890-1894	1	2.4	17	94
1895-1899	0	9.8	16	0.6
1900-1904	1	0.8	16	6.3
1905-1909	1	2.9	17	6.8
1910	0	11.6	15	3.6
1911	1	0.3	15	3.6
1912	0	10.5	14	9.1
1913	1	1.6	17	1.2

After 1900 the highest prices of cocoons were in 1907, namely 1s 5; with the raw silk at 18s 2 $\frac{1}{4}$ d; but in 1908 and 1909 the former fell to 1s 1d and 1s 3d and the latter to 15s 8d and 16s 6 $\frac{3}{4}$ d.

At the same time, this fall in prices, due to competition from China and Japan, allowed the world's consumption to quadruple itself in the years, as the use of silk extended to all classes; this gave a fresh impetus to the industry. But the same causes produced difficulties for the Italian industry and rearing, especially in conjunction with the increased cost of labour. The rearers and manufacturers fought against these difficulties and held out for over ten years, so that up to 1907-08 the increase in the production of cocoons kept pace with the increase in the silk trade shown by the following figures (in millions of francs):

Periods and years	Imports	Exports
1891-1895	114.6	321.8
1896-1900	147.3	410.9
1901-1905	218.5	555.6
1906	250.5	683.7
1907	314.0	710.2
1908	242.5	553.4
1909	236.3	615.6
1910	269.5	583.1
1911	259.7	505.7
1912	212.8	549.5
1913	200.3	497.1

The data on the commercial activity also show an *optimum* in the period 1907, in which the imports averaged about £10 000 000 per annum and the exports about £26 600 000. But from then up to 1913 there is of about £8 800 000 in the total trade, which is a very eloquent index of the difficulties against which silkworm rearing and the silk industry had to contend. They have had to struggle for several years against low prices and sometimes even to work at a loss and to resist the formidable competition previously mentioned. This explains the recent decrease of raw silk production, which in its turn is a source of serious embarrassment to the silk industry, depriving it of the exceptionally good raw material which can supply the classical raw silks for the trade and the first class fabrics of the Milan and Como looms. It is one of the chief causes of the recent decline in raw silk exports, which concern more raw silk than the fabrics, as the deficit in raw material from the country cannot be replaced by Asiatic raw silks.

It will thus be readily understood that all engaged in the silk industry with the greatest interest the efforts made to increase silkworm breeding in Italy and especially in the south, where it was once flourishing. During the last twenty years the Italian bibliography on agriculture, silkworm breeding and silk is full of works which treat of this increase and aim at furthering the planting of mulberries and raising worms in Southern Italy. It is assumed that this object will be attained, for the history of Italian silkworm breeding shows that it has contended with and overcome more than one serious obstacle in the past.

Thus in 1850-55 it received a severe blow from the invasion of the South, which carried off half the worms and almost annihilated silkworm breeding in the South. At this time the producers of silkworm eggs of the north of Italy had resort first to Turkey and Anatolia, then to Persia, Turkistan and China, and lastly to Japan, thus saving the national silkworm breeding and silk industry. Meanwhile distinguished scientists investigated the causes of the diseases of worms; Dubini had already discovered *Botrytis bassiana*, the cause of muscadine, in 1832, and later Emilio Ribera discovered the corpuscles of pébrine and proved the hereditary transmission of the disease. Pasteur in France and Gaetano Cantoni in Italy, availing themselves of the discovery, invented the cellular method of preparing silkworm eggs with the aid of microscopical examination, thus allowing the constitution of the old Italian breeds. This gave rise to a new industry: the preparation of eggs free from pébrine. At the same time the technique of spinning and weaving made wonderful progress, the industry of by-products was founded and our silk fabrics steadily gained ground in foreign markets.

The State on its part favoured the movement by founding the Padova Silkworm Breeding Station under the direction of the famous silkworm expert, and silkworm observatories; it arranged for instruction on the subject to be given in agricultural schools, as well as by the travelling lecturers; it held special competitions, founded schools of weaving and dyeing at Como, and assisted industrial and technical educa-

tion. In addition to all this, private initiative joined in the work, chiefly by instituting cooperative esiccators, that is establishments in which the cocoons of the agricultural members are suffocated, dried and stored thus avoiding the necessity for selling the fresh produce within a few days. A private society, the "Anonima Cooperativa per la Stagionatura di Sete" of Milan, founded and kept up by itself the laboratory for the study of silks, from which very valuable contributions to the technique of the industry have been and are being made.

Altogether few Italian sources of production and of industrial activity have been the object of so much study and free and successful initiative as silkworm raising and the silk industry.

Among the difficulties mentioned above, must be included a parasite of the mulberry, *Diaspis pentagona*, a most injurious scale insect from Japan which invaded the mulberry plantations in 1890. For its control it became necessary to enact laws rendering obligatory the use of certain insecticidal emulsions, but the work of scientists was still more beneficial. Prof. Antonio Berlese discovered an entomophagous parasite, *Prospaltella berlesii*, which now successfully controls the Japanese fruit scale. Meanwhile, however, in many localities numbers of mulberries had perished or were in such a bad state as to induce the farmers, tired with the struggle against so many adverse conditions, to cut them down.

The above-mentioned efforts to improve the conditions of sericulture were not sufficient, in view of the many difficulties which beset it, to attain their aim, and the Government had naturally to take the matter into serious consideration, owing to the great interests involved. After several measures, in January 1907 the Government decided upon an enquiry by a Commission under the presidency first of the Hon. L. Luzzatti and then of the Hon. Senator Cavaola, at present Minister of Agriculture. The Commission presented its report in 1910; this dealt with the conditions of Italian sericulture, the causes of its depressed state and the measures to be adopted. It is naturally impossible to give a résumé of it here; it will be enough to say that the Commission declared in its conclusions that the greatest evil which afflicted the silk industry was the want of organization, and it proposed the foundation of a Silk Institute as an independent body for the purpose of furthering the progress and the improvement of sericulture. Besides this measure, it recommended suitable provisions for credit, for the remission of way tariffs, for the carriage of cocoons, silk and silk fabrics, and for the remission of customs tariffs, with the object of facilitating the importation of raw materials required by the industry. It advocated also the extension of instruction in silkworm rearing and mulberry growing, especially in the colleges of Milan, Perugia and Portici. It demanded especially that the State should aim at obtaining an increase and a progressive improvement in the production of national raw material, so as to supply completely the Italian

(1) One of the most important esiccators is that of Cremona, which was founded chiefly by the exertions of Prof. Antonio Sansone, then director of the royal professorship at Cremona and now Director-general of Forests.

ries and to keep up the character of Italian goods, which cannot be given by raw material of other countries. Lastly the Commission asked that a complete and accurate study be made of the foreign silk trade and industry. The proposal of the foundation of the Silk Institute was not, however, adopted by Parliament, which nominated a Council for the Silk Interest, giving to the Ministry of Agriculture £48 000 per annum for the above-mentioned objects, including the sending of special delegates to the silk industry in some countries in Europe and to New York, with the object of bringing in touch with the trade in raw material and in silken fabrics. The sum was distributed as follows: For promoting silkworm rearing, mulberry growing, studies on silk, foundation of cooperative associations, etc., £10 000 and £4 000 in the financial year 1912-13. For the intelligence service and statistics £4 000. For the establishment of mulberry groves £10 000. For the increase of the endowment of the Como school of silk industry, for the new station of Ascoli, for the increase to the contribution to the Padua Station and for the three chairs in Milan, Portici and Perugia, £6 000. For scholarships to special courses in silkworm rearing at the above schools and other forms of propaganda, £4 000. For increased subventions to travelling lectureships, £4 000. Lastly, £10 000 for the first cost of the plant of the newly founded institutions and for the increase of the plant of the already existing ones £10 000. The Silk Council was definitely constituted in July 1912 and has now entered upon its labours. It has appointed technical delegates in China, Japan, New York and other localities. It has turned its attention to the furtherance of professional instruction and provided for the encouragement of mulberry growing and silkworm rearing in all the regions of Italy; special attention has been paid to the south, which used to produce still produces cocoons yielding abundance of good silk, notwithstanding the imperfections in the technique of managing the worms. During the 1914 season the Council started the publication of a Bulletin containing information on the cocoon crop in Italy and abroad and on every subject likely to interest the silk market.

The Ministry of Agriculture in its turn, availing itself of schools, travelling lectureships and other kindred institutions and of the above-mentioned funds, has begun a liberal distribution of mulberry trees and of silkworms; it has organized special courses of instruction and has encouraged a number of breeders with an ample distribution of suitable instructions. Among these, special stress is laid on those which tend to teach the methods of diminishing expenses and consequently the cost of mulberry trees and of cocoons.

As for the former, it has been recognized as advantageous in many instances to replace standard mulberry trees by hedges, low pollards, and so-called mulberry meadows, a kind of coppice which is cut every year and which renders the collection of the leaves much less expensive. In rearing, breeders are advised, instead of feeding the worms on detached leaves, to give them whole shoots or twigs, as has been practised for a long time past

in Venetia. As regards the lack of housing, especially in the South, it has been shown that the Persian sheds or *tilimbars* are very convenient; they are built of poles and branches of trees at the beginning of the season and are dismantled as soon as the cocoons are gathered. Several tests of this system, especially those carried out at the Portici Agricultural College, Prof. Gustavo Leonardi, have demonstrated its superiority over other systems and its economy, especially under climates favourable to the work like that of the South of Italy.

The above-mentioned law has provided for the greater and permanent spread of instruction and experimentation by founding a second Silk Rearing Station at Ascoli and three new chairs of silkworm rearing at the Milan, Perugia and Portici Colleges. Many of these institutions are already in full work, and others will soon be founded with them the whole series of measures for the attainment of the objects above-mentioned will be completed. The Divisions of Industry and Agriculture are actively devoting themselves to the work, whilst the Silk Council in its turn contributes opportune suggestions and expresses the real conditions and requirements of the country. Everything encourages us to hope that two of the most ancient and important sources of national wealth, increased and strengthened by their own activity without artificial help and fiscal protection, will soon resume the place they once occupied in Italian public economy.

SECOND PART. ABSTRACTS

AGRICULTURAL INTELLIGENCE

GENERAL INFORMATION.

Agriculture in Sweden.— *Sweden, Historical and Statistical Handbook*, published by the Government by G. GUINCHARD; second part: *Industries*, pp. 29-232. Stockholm, 1913.

In the year 1910, out of the 5 522 000 inhabitants of Sweden, 2 663 000 or 48.3 per cent., were occupied in agricultural pursuits; in 1900 the percentage was 53.67 and in 1870, 71.87. Since 1880, in spite of the steady increase of the population, there has been also an absolute decrease in the agricultural population which then numbered 3 078 000 persons. The cultivated area of the country was divided in 1911 among 359 871 farms with an average area of about 25 acres under cultivation. The size of the farms has a very wide range. In the official statistics the groups are arranged according to size as follows:

Size-group	Relative number
Up to 5 acres	25 per cent
5 to 50 "	64 "
50 to 250 "	10 "
over 250 "	1 "

As regards the area of cultivated land, small farms up to 25 acres and farms over 125 acres each account for about $\frac{1}{4}$ of the total, the other being occupied by the medium-sized ones. The extensive plains with fertile loam and clay soils in Central and Southern Sweden have very many large farms, while small farms are prevalent in the higher districts in the west and north of the country, on sandy and gravelly soils, where the cultivated land is cut up by mountains, woods and moors.

In general in Sweden, farmers own the land they farm; in 1911 a little over 14 per cent. of the whole number of farms were rented. Among the smaller farms renting is particularly uncommon (10 and 13 per cent. in the two smaller size-groups), while in the two groups of larger farms with over 50 and over 250 acres, it is more frequent (31 and 35 per cent.).

In 1911 the total area of the country, 101 566 950 acres, was divided as follows:

Fields and gardens	9 144 700 acres or	9 per cent.
Meadows	3 226 325 "	3.2 "
Woods	52 828 600 "	52.0 "
Other descriptions	36 367 325 "	35.8 "

The arable area of Sweden has quadrupled in the last century. Table I shows the changes which took place in the areas occupied by the various crops between 1865 and 1911:

TABLE I. — *Area under chief crops in 1865 and 1911.*

	1865	1911	1865	1911
	acres	acres	%	%
Cereals	2 908 500	4 141 600	50.5	40.8
Forage crops	1 569 200	3 355 800	27.2	33.0
Root crops	333 600	635 100	5.8	6.2
Other crops	51 900	7 400	0.9	0.1
Fallow	902 000	892 100	15.6	8.9
Total	5 765 200	9 032 000	100.0	100.0

The relative areas under the various kinds of cereals have changed considerably in the course of time; barley, which was formerly the most grown, has gradually lost importance, with the exception of Västmanland where it takes preference to other grain on account of its early ripening. As breadstuff barley has been chiefly replaced by rye; at beginning of the 19th century the quantity of barley and rye harvest was about equal, while at the end of the century the rye crop was no more than twice the barley. Of late years the area under wheat has grown steadily without however ceasing to hold the lowest place among the four chief cereals both for area and total yield. Oats have gained most of all importance, now occupying almost half the area under cereals in the country; the crop is equal to that of barley, rye and wheat together, besides which the bulk of the increasingly grown mixed grain is oats.

Of less importance in area occupied and in value are pulse crops (peas, beans, and vetches) and buckwheat, which is now grown only to a limited extent in the poorest sandy regions of Schonen.

With the increase in area under cultivation an increase of yield per acre has also taken place; it is due to improvements of the land and

Period	Total	Wheat	Rye	Barley	Oats	Mixed grains	Pulse
<i>Area (in acres).</i>							
1801-1820*	1 364 300	37 450	444 750	397 750	280 500	142 100	61 750
1821-1840*	1 780 850	53 000	583 200	463 300	375 600	202 600	111 250
1841-1860*	2 251 250	82 250	722 750	519 000	559 700	231 650	135 900
1861-1880*	3 187 580	143 927	877 382	556 492	1 275 241	168 638	135 900
1881-1890*	3 869 790	180 144	949 678	557 285	1 816 181	235 908	135 595
1891-1900*	4 170 709	179 356	1 001 475	542 999	2 024 868	296 369	125 702
1901-1905*	4 226 116	200 721	1 015 123	527 718	2 037 934	338 287	106 333
1906-1910*	4 176 192	220 302	1 002 152	476 034	1 987 278	383 227	101 198
1911	4 142 411	250 764	988 863	446 133	1 951 862	403 871	100 978
<i>Yield (in metric tons)**.</i>							
1801-1810*	620 700	16 200	195 000	200 000	120 000	64 000	25 500
1811-1820*	691 800	19 800	224 000	220 000	130 000	70 000	28 000
1821-1830*	813 200	30 000	280 000	230 000	140 000	84 200	49 000
1831-1840*	864 400	35 000	315 000	225 000	155 000	86 900	47 500
1841-1850*	1 029 000	43 000	347 000	270 000	1 94 000	110 000	65 000
1851-1860*	1 354 500	62 000	455 000	308 000	348 000	118 500	63 000
1861-1870*	1 540 000	70 000	455 000	300 000	560 000	101 000	54 000
1871-1880*	1 802 602	91 400	495 200	341 754	773 632	113 931	76 685
1881-1890*	2 138 217	101 800	526 700	336 155	960 467	140 115	72 980
1891-1900*	2 342 900	123 300	580 600	314 500	1 071 800	184 300	65 400
1901-1905*	2 138 587	130 777	555 937	282 959	926 305	105 902	42 146
1906-1910*	2 539 203	191 890	593 865	299 029	1 123 228	276 951	53 639
1911	2 477 803	217 844	592 949	289 401	1 039 540	284 394	53 675

* Yearly average for the period.

** One metric ton = 0.842 English ton or 1.1023 short ton.

TABLE III. — *Importation and exportation*

	Wheat, whole and milled			Rye, whole and milled	
	Import	Export	Excess of import	Import	Export
1816-1820.	1 505.7	129.7	— 1 376.0	16 098.7	114.5
1821-1840.	159.5	794.2	+ 634.7	4 330.7	1 246.6
1841-1860.	2 454.9	3 662.7	+ 1 209.8	13 343.8	13 109.1
1861-1880.	27 087.3	10 137.6	— 16 949.7	106 274.1	3995.9
1881-1890.	83 796.6	6 851.8	— 76 944.8	173 502.8	3096.1
1891-1900.	146 558.0	1 151.8	— 145 406.2	114 212.1	2324.4
1901-1910.	207 102.5	180.9	— 206 921.6	94 438.1	4844.3
1911.	181 740.5	829.9	— 180 910.6	52 805.6	1473.0
1912.	179 860.0	795.3	— 179 064.7	116 762.8	435.6

abundant and suitable manuring, more thorough tillage, and the introduction of a more intensive rotation. The changes which have taken place in the acreage and yield of the various cereals and pulse crops since 1816 are shown in Table II.

Notwithstanding the increase in the production of grain in Sweden namely from 598 lbs. per inhabitant at the beginning of the 19th century to 1 045 lbs. at present, among which breadstuffs figure for 205 and 275 lbs. respectively, a good deal of the constantly increasing consumption has to be met by importation.

In most of the twenties of last century the breadstuffs (wheat, rye and barley) harvested were sufficient for the wants of the country and saw an increasing export trade began, at first only with oats, but in the forties with barley, rye and wheat. In 1860, however, most of the exports ceased and the importation of wheat and rye in constantly larger quantities set in; up to the middle of the eighties this was partly balanced by the exportation of oats, but after that time this also began to slacken owing to the rising demands of the developing animal husbandry; the result is that since 1902 the imports have been in excess of the exports by 2 to 3 millions sterling per annum. The condition of the trade is shown in Table III.

The following root crops besides potatoes are grown in Sweden: beets and mangolds, Swedes, turnips and parsnips. Between 1901 and 1910 about 1 450 100 tons of potatoes were grown yearly on 378 693 acres; this gives 614 lbs. per inhabitant, which is not much below the average figure for the west of Europe, namely 682 lbs.; deducting the seed (or about 10 cwt. per acre) there remains available for consumption 535 lbs. per inhabitant. Every year about 100 000 tons are used by the distilleries.

in metric tons).

Barley			Oats		
Export	Excess of import		Import	Export	Excess of import
2 07.9	—	5 874.7	521.4	430.8	— 90.6
1 647.1	—	1 272.4	597.3	2 790.0	+ 2 192.7
12 907.3	+	10 778.0	110.4	28 647.9	+ 28 537.5
29 663.1	+	23 291.6	541.1	189 174.0	+ 188 632.9
23 146.7	+	15 513.7	2 930.7	197 710.0	+ 194 779.3
2 023.6	—	4 212.3	11 773.5	87 899.1	+ 76 125.6
87.1	—	2 400.0	69 052.8	9 021.8	— 60 031.0
5 379.5	+	4 100.0	102 051.9	28 091.8	— 73 960.1
3277.4	+	3 271.3	97 288.8	5 236.8	— 92 052.0

The area under sugar-beets has increased from about 45 000 acres in the eighties of last century to 75 000 acres in 1911; the average crop for period 1901-10 was 8 130 000 tons, or 11 tons per acre. The sugar beet has steadily increased, the yield of unrefined sugar having risen 6.6 per cent. in 1870 to 15.72 in 1911.

Forage crops were grown in 1911 on 3 355 227 acres, or 37.1 per cent. of cultivable land. The forage plants most commonly grown are timothy and red and alsike clovers. The yield of grass leys is, according to official statistics, about 20 to 28 cwt. per acre, making altogether between 3 and 4 million tons; to this must be added the hay from natural meadows, at 8 or 10 cwt. per acre., or about 1 ½ million tons. Accordingly the total hay crop, not including pastures, amounts to upwards of 5 millions, worth about £14 000 000, or a third of the value of the total produce of the country.

Sweden possesses a great extent of pastures, but there are no available statistics as to their area and yield.

The area devoted to the cultivation of plants other than grain, root and forage crops, amounted, in 1911 to only 4038 acres, of which 3783 were devoted to textiles.

The land in Sweden devoted to horticulture is given for the same year as 2 978 acres, or about 1.25 per cent. of the cultivated area. Fruit growing is the principal branch and is carried on intensively in some localities.

The growing of flowers under glass has also considerably developed. Vegetables are grown all over the country both for private consumption and for sale. Schools for gardeners exist at Alnarp in Schonen, Adelsö in Östergötland, Experimentalfältet near Stockholm and Härnösand in Norrland. Special schools of gardening for women are those at Exper-

näs in Närke and Torshäll in Dalarna. Cooperation in horticulture in a flourishing condition.

Animal husbandry (1) has been from time immemorial the chief branch of agriculture in Sweden. According to official statistics the live stock in 1911 consisted of the following :

Horses		Steers	Bulls	Cows	Cattle under 2 years	Sheep	Goats	Pigs	Bees
under the age of 3 years	over								
493 322	95 163	144 277	52 467	1837 038	655 830	945 709	66 136	951 164	7

By the thirties of last century the importation on a large scale of foreign, especially English, breeds of live stock had already begun. The State promoted breeding by the institution of central breeding farms for cattle and sheep; these were, however, broken up about the end of the 19th century and the stock sold off. The proceeds were devoted to a "Fund for the improvement of Swedish cattle and sheep". One of the general measures adopted for the promotion of animal husbandry is prize giving; this is now the most important. There are prizes for horses, cattle, sheep and pigs. In 1911 the amount spent in prizes for cattle was £16,000, of which the State contributes £6,600.

At present the five following breeds of cattle are awarded prizes:

- 1) The *Fjäll* (North Swedish cattle) in Norrland and Dalecarlia; the cows yield about 550 gallons of milk per annum with an average content of 3.8 per cent. fat; their live-weight is about 770 lbs.
- 2) The *Swedish Red Poll* in Dalarna, Bohuslän and other districts; their milk yield and live-weight are about the same as in the *Fjäll*.
- 3) The *Ayrshire* in Southern and Central Sweden; the cows yield about 770 gals. of milk containing an average of 3.6 per cent. of fat; their live-weight is about 1000 lbs.
- 4) The *Red Spotted Swedish* in Central Sweden; yearly milk yield about 880 gals. with 3.8 per cent. fat; average live-weight 1100 lbs.
- 5) The *Black Spotted Swedish Lowland* in Southern Sweden; yearly milk yield 990 gals. with 3.3 per cent. fat; live-weight about 1265 lbs.

In the year 1911, 58 020 animals were exhibited, 50 761 taking prizes. Besides the awarding of prizes the following measures have also contributed to the success of Swedish animal husbandry: the institution of herd books, the auctions of breeding cattle, the competitions for the formation of cattle-breeding centres, the record associations and the veterinary and educational services.

In the breeding of horses heavy draught horses occupy a prominent position. To this type belong the Dalbo horse in Dalsland and Norrland, Bohuslän and the North Swedish horse. They are rather small but powerful.

(1) See also E. O. ARENANDER: "The recent development of Cattle Breeding in Sweden". — B. Oct. 1913, pp. 1502-1511.

assistant and exceptionally thrifty animals. In order to give the horse more bulk and strength the following foreign strains of have been introduced, especially since the middle eighties of last y: Percherons, Pinzgaus, Clydesdales, Norwegians and Belgians. The first two have not had any notable influence on the native breeds. Clydesdales, which in Wästergötland laid the foundation of the Levene have had a certain importance, especially in the beet-growing district; but they are giving place to Belgian Ardennes, which have been crossed with the native breed to produce a compact, powerful horse with action (1). In 1901 the studbook for Swedish Ardenne horses was published; out of the hundred or so stallion and horse-breeding associations existing in the country about seventy aim at the production of an Ardenne

of much less importance than the breeding of draught horses is the breeding of half blood horses, which are chiefly devoted to the production of army remounts. For these there are two stallion depots: Flyinge and Hönö and Strömsholm in Västmanland, with about 230 stallions. Of these about 20 are English Thoroughbreds, the rest Hanoverians and Prussians. The breeding of Thoroughbreds in Sweden is insignificant. The breeding of ponies gains constantly in importance; the demand for is met by importation from Iceland.

The breeding of pigs has gained much importance since the beginning of the present century. The pig-breeding associations and stations are assisted by the State. Only English Large Whites and Swedish or Danish pigs are awarded prizes.

Sheep breeding is constantly losing ground. For the improvement of the sheep Cheviot rams, some imported from Scotland and some raised in Wästergötland, are used. In Southern and Central Sweden some English breeds, such as Oxford, Shropshire and Southdown, are kept. Merinoes, which in the eighteenth century were very numerous, are now reduced to about three hundred head in Södermannland and Östergötland.

The breeding of reindeer is more important. In Sweden a distinction is made between the high mountain reindeer and the forest reindeer. The former spend the summer in the high mountain land and only the winter in the woods, while the latter live throughout the year in the woods. The number of the Swedish stock of reindeer may be estimated at about 2250 000, and its yearly returns are upwards of £55 000.

Poultry breeding is highly developed in the south of Sweden. There is considerable exportation of eggs and birds. The number of head of poultry is estimated at 4 250 000. The General Poultry Association, founded in 1898 included, in 1910, 23 district associations with 6 601 members. There were also in the same year sixty egg-purchasing cooperative associations within the Län Malmöhus; these collected eggs from 160 selling stations.

1) See No. 754, B. Aug. 1914.

Bee-keeping has also made considerable progress during recent years. The number of hives in 1911 was at least 120 000; the yearly output of honey was estimated at 1 320 000 lbs. and that of wax at 23 760 lbs.

Table IV shows the foreign trade in animals and their products in recent years.

TABLE IV. — Imports and exports of animals and their products.

	Imports		Exports			
	1908	1912	1908	1909	1910	1911
Horses head	1 953	2 224	3 991	2 514	4 264	6 141
Cattle "	4 817	2 806	9 767	12 558	33 437	34 141
Sheep "	91	141	1 753	1 761	1 920	2 141
Figs "	6 528	5 358	10 126	61 007	53 882	129 141
Pork lbs.	10 150 899	3 350 171	6 124 298	4 756 011	6 581 571	23 121
Other meat . . . "	5 358 032	4 072 983	1 370 255	2 000 383	6 445 441	19 121
Cheese "	804 047	1 276 464	4 611	129 892	51 058	11 141
Butter "	275 051	272 547	346 784	48 274 065	47 849 903	46 721
Margarine . . . "	6 017	325 224	1 015 879	215 983	202 200	4 141
Lard "	4 874 252	1 911 945	109 571	22 222	58 089	3 141
Tallow "	13 653 977	6 756 774	1 772 593	1 110 809	1 989 123	1 311
Hides, unworked . "	16 975 185	26 342 622	14 885 506	19 862 174	22 164 857	23 141
" worked . . "	1 518 783	2 182 275	426 208	118 250	147 213	2 141
Bones and bone meal "	19 675 379	14 146 612	67 021	52 811	358 701	1 311
Wool "	12 275 047	145 721	71 093	208 580	140 424	1 141
Honey "	151 954	41 111	1 373	163	684	1 141
Wax "	43 858	68 919	11 669	6 574	7 984	2 141
Eggs No.	35 876 176	51 915 380	38 837 492	37 358 12	41 516 566	44 121

Dairying in Sweden, the history of which can be followed back seven centuries, has developed very considerably since the milk separator was invented in 1878. In 1910 there were 1382 dairies in the country of these 542 were cooperative dairies, 457 collecting dairies, 276 estate dairies and 107 estate collecting dairies. Cooperation is most widely diffused in the southern and northern parts of the country, while in Central Sweden the estate and collecting dairies prevail. In 1911 the total amount of milk delivered at the dairies was 252 828 394 gals., of which 30 133 gals. were sold as whole milk; the rest, upwards of 220 000 000 gals., was used in the manufacture of cheese and butter. The dairies producing only butter numbered 845, while 327 produced only cheese, and 208

and cheese. The amount of butter produced is constantly increasing: it was 57 450 840 lbs. in 1900, 61 598 700 lbs. in 1905 and 4 577 lbs. in 1910. The production is most intensive in Schonen Halland, where in 1910 about half of all the butter produced in the country was made. Of the butter exported, 75.01 per cent. goes to England, 20.74 per cent. to Denmark and only 3.92 per cent. to Germany and 33 per cent. to other countries. The preparation of cheese has made slow but steady progress during the last twenty years; the increase has been observed only in fat cheeses, the production of the other cheeses being in decline.

Further assistance to dairying in Sweden is offered by the labourers, by instructors and advisers, by the schools of dairying, by the dairy exhibitions, by the organization of the examinations of butter and of the butter that has been examined being distinguished by a special mark). The Royal Agricultural Department, under the Ministry of Agriculture, was instituted in 1900, is at the head of the State agricultural administration, of the peat and fishery inspectors and of the 22 agricultural engineers; the 26 Chambers of Agriculture at present existing, it takes all the measures calculated to promote agriculture or proposes them to the Ministry.

Sweden possesses at present 15 farming schools, 33 schools of agriculture in which practical and theoretical courses lasting at least 20 weeks are held, two upper housekeeping schools in which women teachers of housekeeping are trained, two agricultural institutes for higher agricultural education (Alnarp and Ultuna), three schools of farriery and one veterinary college (Stockholm).

Further chapters treat of agricultural credit, of the control and extension services (17 chemical control stations, one State central institution for agricultural experimentation and several other experiment stations connected with the agricultural institutions or founded by associations of farmers of agriculture, 17 seed control stations), of the question of the Society for the Improvement of Agricultural Plants, Swedish Geese Seed Company and Svalöf Institute (1), the work of the Swedish Cultivation Society and other agricultural associations, the measures promoting agricultural book-keeping, the question of agricultural law, and agricultural legislation in general and that of farm renting in particular.

Forestry is discussed in a section by itself, from which a few figures are given to show the importance of forestry in Sweden. Of the whole area of the country, 52 per cent. is covered by forest; that is 969 acres per inhabitant, while Russia has only 415 for the same number. The 110 million acres of forest represent a total value of about £85 756 000. One-third of the forests are property of the State or of public bodies,

1) See NILSSON: "The Swedish Institute for the Improvement of Field Crops at Alnarp." — *B. June 1913*, pp. 834-843. (Ed.).

the rest being private property. In 1911, 1 329 million cub. ft. of ~~w~~ were cut; in 1913 the value of wood imported amounted to £1 049 against £16 595 000 exported.

871 - Control of Beri-Beri: Curative Action of Autolysed Yeast Against Polyneuritis. (1) — COOPER, EVELYN ASHLEY (Beit Memorial Research Fellow, Institute) in *The Biochemical Journal*, Vol. VIII, No. 3, pp. 250-252. Cambridge June 1914.

The autolysis of yeast was obtained by placing pressed brewers' yeast in a flask in a hot room (35° C.) for 36 hours, when the yeast was rapidly converted into a brown fluid. This was filtered and the residue washed with a little water. Pigeons affected with polyneuritis were readily cured by 3 cc. of this liquid.

Experiments were also made with air-dried yeast, which had been stored for six weeks; to this some water was added and it was then allowed to autolyse at 35° C. for 48 hours; the filtrate was found equally curative.

The writer summarizes the results obtained as follows:

1. By the autolysis of brewers' yeast a solution can be obtained which possesses as marked curative properties towards avian polyneuritis as the original yeast.

2. The solution retains its curative power for at least eight months and when given orally to birds in doses 10 times as great as the minimum curing dose has no toxic action.

3. An air-dried yeast retains its curative power after storage for years in a dry tin, and still autolyzes after storage for four months.

The writer concludes that the autolysis of brewers' yeast should be a simple and inexpensive method of preparing a non-toxic solution suitable for the oral treatment of human beri-beri.

872 - American Black Flies. — NALLOCH, Y. R., in *U. S. Department of Agriculture Bureau of Entomology, Technical Series*, No. 26, pp. 72 + 6 plates. Washington April 6, 1914.

The *Simuliidae* are of considerable economic importance as parasites of domestic animals and man. The writer gives a classification and scientific description of the American species in all phases of their life cycle based on a study of the collections in the United States National Museum. He distinguishes 5 species of *Prosimulium*, one of *Parasimulium* and of *Simulium*. A bibliography of 26 works on the subject is appended.

873 - Agricultural Schools in Panama. — *Daily Consular and Trade Reports*, No. 172, p. 476. Washington, July 24, 1914.

Two agricultural schools are to be established in Panama. One of the schools will be located near New Gorgona. The Government is also contemplating the establishment of an agricultural experiment station.

(1) See also No. 1130, B. Aug. 1912.

The Experiment Farm at Genale, Italian Somaliland. — ONOR, R. (Agricultural Adviser at Genale) in *Giornale di Agricoltura della Domenica*, Year XXIV, No. 30. Genoa, July 26, 1914.

The fundamental technical problem in the agriculture of Benadir is that of irrigation. When that is overcome one may say that, apart from questions of practical convenience, almost every tropical crop is possible. On the other hand the draught animals are liable to serious parasitic diseases, so that the questions of cultivation of the land and transport are an additional problem. Further, in addition to these and other practical problems of first-rate importance, is the question of the economic value of the various crops.

In view of these facts the Government decided on the formation of an experiment farm at Genale, to which the Governor added four farms allotted to four families of Italians with a view to facilitating a preliminary colonization experiment. In February 1912 the first huts were built and the station is now assuming its normal aspect with brick buildings constructed locally.

The mechanical elevation of the water for irrigation, which has been provided for at Genale by centrifugal pumps worked by oil engines, together with the possible utilization of the wind, and the application of motor power to agricultural work and transport, are all questions for investigation which will entail considerable funds. Further, the administrative side of the farm will render assistance by providing information of great practical value. The book-keeping, which during the initial period owing to the opportunity offered, concerned only with certain items only, is now carried out like that of any private enterprise.

The progress of the scheme has not so far allowed well organized experiments to be conducted, especially as the largest share of attention must be given to crops which seemed likely to be of the greatest economic importance in Benadir. Among the plants already studied and those under experiment are the following:

- I. Starch-producing plants: *Manihot utilissima*, *Dioscorea Batatas*.
- II. Cereals: oats, maize, millet, barley and Indian upland rice.
- III. Rubber plants: *Manihot Glaziovii*, *M. dichotoma*, *Funtumia* sp., *Parthenium argentatum*.
- IV. Dye and tannin plants: *Bixa orellana*, acacias, *Carthamus tinctorius*.
- V. Spices: *Coffea liberica*, *Zingiber officinale*.
- VI. Textile plants: *Fourcroya gigantea*, *Agave Sisalana*, *Corchorus* sp., various cottons, *Eriodendron anfractuosum* (kapok), *Hibiscus* sp., *Rafia*.
- VII. Oil crops: coconut, earthnut, sesame, castor-oil.
- VIII. Sugar crops: sugarcane, Minnesota sorghum.
- IX. Fruits: *Citrus* spp. (orange, lemon, tangerine, grape-fruit), *Muricata*, *Cherimolia*, *Mangifera indica*, olive, guava, bananas, pineapple.
- X. Narcotic plants: tobacco.

XI. Timber trees and various: *Inga dulcis*, *Poinciana regia*, *Tamarindus indica*, *Terminalia Catappa*, tamarind, *Eucalyptus Lehmanni*, *E. citriodora*, *Catalpa odorata*, *Cassia florida*, *Casuarina equisetifolia*, *C. tenuissima*, bamboo, *Parkinsonia*, mulberry.

XII. Vegetables: French beans, *Dolichos*, cowpea, soy bean, capsicum, egg-plants, onions, cabbage, chicory, beetroot, *Hibiscus esculentus*, cucumbers, etc.

XIII. Leguminous forage plants: lucerne, sulla, sainfoin.

875 - The Reorganization of the Experimental Garden at Hamma, near Algiers. *Bulletin de l'Office du Gouvernement Général de l'Algérie*, Year 20, No. 12, pp. 194-195, Algiers, June 15, 1914.

Several years ago the experimental garden at Hamma, which has been leased to a financial company in 1883, was taken over by the Algerian administration and reorganized on a rational system with a view to its better utilization. With this object two decrees were issued on June 5, 1914, the first cancelling the previous lease and approving the necessary equipment, the second defining the reorganization of the garden.

According to article 1 of the second decree, the experimental garden at Hamma is to serve the purpose of a nursery for the production and distribution of native crops and as a garden for scientific studies and the acclimatization of exotic plants.

The staff of the garden consists of administrator, head gardener and clerk. The governing body consists of a permanent technical commission, comprising the following:

- The Director of the Botanical Department.
- The Professor of Botany.
- The Director of the Pasteur Institute.
- The Chief of the Forestry Research Station.
- The Chief of the Agricultural Department of Algiers.
- The Delegate of the Algerian Horticultural Society.

The garden collaborates with the Departments of Phytopathology, Forestry and Entomology, the Faculties of the University of Algiers, and on advice from the technical commission, all other public services which require it. A museum of natural history for North Africa, the necessary laboratories and a small zoological park may be added, and a department of horticultural instruction will be organized for the education of work gardeners and grafters.

CROPS AND CULTIVATION.

876 - A New Method of Determining the Density and Porosity of Soil and Rock. TRUKA, RUDOLF (Tábor, Bohemia) in *Internationale Mitteilungen für Bodenkunde*, Vol. IV, Part 4-5, pp. 363-387. Berlin, 1914.

The writer has devised a new method for the determination of the specific gravity of soils and rocks, based on the researches of Dr. Sla. Its novelty consists in detaching a lump of earth from the interior of a

rock without subjecting it to pressure or in any way altering its natural

The small lump is dried at 100° to 103° C., then plunged in liquid in at a temperature of 40 to 50° C., so that it becomes covered with a thin layer of paraffin. The volume of the sample is determined by cement of water in an apparatus specially designed by the writer, who describes it in great detail.

The method is applicable to all types of adhesive soils and the writer continues his studies with a view to devising a method suitable for all soils. An examination of the results obtained by this and other methods has led the writer to the following conclusions:

1. *Specific gravity.* — 1) If the density of a soil is to be used for determining its physical properties, a more exact method is required.

2) Those methods in which a given volume of soil is obtained by a standard measure, or by sedimentation in water, should be abandoned, since they do not take into account the stratification of soil.

3) Methods involving the sampling of the soil by means of cylinders should also be abandoned, since the experimental error is too

4) The only method that can be recommended is one which consists in taking lumps of earth showing the natural stratification unchanged, by reducing the error to a minimum.

3. *Porosity.* — 1) For the porosity to be an exact indicator of the properties of the soil, it must take into account the natural stratification of land.

2) Any disturbance of the natural lie of the soil in sampling is inadmissible as it will lead to changes in the porosity.

3) The determination of the porosity by means of a lump of soil showing natural stratification is the only method which gives results agreeing with practical experience.

4) Porosity cannot be considered alone in determining the value of a soil; other properties must be taken into account.

A New Method for the Determination of Soil Acidity. — TRUOG, E. (Wisconsin Experiment Station) in *Science*, Vol. XL, No. 1024, pp. 246-248. Garrison, N. Y. August 14, 1914.

Acid soils boiled with zinc sulphide and water liberate sulphuretted hydrogen, traces of which can be easily detected with lead acetate paper. On this basis the following method of determining soil acidity was evolved: 10 g. of soil are placed in a 300 cc. Erlenmeyer flask with 1 gm. of calcium chloride, 0.1 gm. of zinc sulphide and 100 cc. of water; the mixture is thoroughly shaken and heated over a flame; after the contents of the flask are boiled one minute, a strip of moistened lead acetate paper is placed in the mouth of the flask and the boiling continued two minutes more, after which the paper is removed. If the soil be acid the paper will be darkened on the under side, the shade obtained varying with the degree of acidity from almost white to black, and the percentage acidity may be estimated from a standard colour scale.

This test is more delicate than the litmus test, is extremely simple to carry out and has proved very reliable; in no case have alkaline soils given a positive reaction, even when they had undergone previous anaerobic fermentation. Experiments are now in progress to make the method more accurately quantitative by titrating the liberated hydrogen sulphide with iodine solution.

878 - **The Ombrone Diversion for the Reclamation of the Plain of Grosseto, Italy.** — LUIGI, LUIGI, in *Giornale del Genio Civile*, Year LII, pp. 254-260. Rome, May 31, 1914.

The Ombrone diversion in the province of Grosseto, Italy, is one of its most important hydraulic works now in course of construction.

It will be capable of conveying 21 200 cubic feet of water per second and in case of need even 24 700 cu. ft., whilst the Cavour Canal (so far the largest in Italy) conveys only 3885 cu. ft., the Ganges Canal 6710 cu. ft. and the Euphrates diversion (1) (hitherto the largest in the world) 14 125 cu. ft.

The object of the Ombrone diversion is not irrigation, as in the above mentioned schemes, but the utilization of the silt carried down by the water for reclaiming, by means of warping, the swamps which the prostration of the river mouth has produced in the neighbourhood of Grosseto.

The flood water sometimes contains for about 24 hours as much as 10 per cent. of silt, and on the average there are six good floods every year.

In order to utilize this material to the best advantage, it is necessary to waste no time in securing the greatest quantity of water when it has its maximum load of silt and to fill all the depressions as speedily as possible; hence the necessity of a large intake with rapidly acting sluices.

The works consist in: 1) a submergible weir across the bed of the river at the head of the canal; 2) a head regulator or barrage; 3) a channel between the weir and the regulator; 4) the main canal for the flood water; 5) distributing secondary channels; 6) channels for draining off the clear water after the silt has been deposited; 7) accessory works for the power plant to work the sluices and for the electric lighting of Grosseto, storehouses, bridges, etc.

The submergible weir is 502 feet long. It is a mass of concrete faced with ashlar. The vertical section of its surface is a sinusoid curve which prevents the formation of vortices. It was built in 1879 and has successfully withstood the heaviest floods.

The regulator barrage has seven openings from 15 ft. 3 in. to 17 ft. 9 in. wide and 20 ft. 7 in. high, closed by sluice gates worked by electric power which can be completely raised or lowered, two at a time, in 8 minutes. The piers of the archways are 3 ft. 8 in. thick.

The main canal is about 180 feet wide at the bottom and is capable of conveying 21 200 cubic feet of water per second with a depth of water of 17 ft. 4 in. and a velocity of 7 ft. 8 in. per second, or 24 700 cu. ft. with a depth of 18 ft. 4 in. and a velocity of 8 ft. 4 in. These high velocities

(1) See No. 414, B. May 1914.

necessary firstly to keep the dimensions of the canal within reasonable limits and secondly to prevent any untimely deposit of silt.

Close to the regulator two buildings have been erected, one for two pairs of 40 HP oil motors which drive the dynamos and a 20 HP motor for the workshops and electric light, etc., and the other as a storehouse, workshop and dwelling house for the workmen.

At the side of the canal between the weir and the regulator there is a building with a one-arch regulator for a power channel for the electric lighting of the city of Grosseto and a grain mill. This channel conveys 176 cu. ft. of water per second.

The main diversion or warping canal is about 10 $\frac{1}{2}$ miles in length; the first 2625 feet it is lined with masonry walls about 164 ft. apart. The rest of the canal is between embankments; it is 213 ft. wide at the water level and 178 ft. at the bottom, in which a small channel has been excavated to drain the canal when not in use, so as to prevent the breeding of mosquitoes. The canal is crossed by seven bridges and feeds the secondary distributing channels which convey the water to the various sections. Provision is also made for the drainage of the adjoining country.

It is calculated that in 24 hours 1236 million cubic feet of water are collected to fill all the warping sections and that the passage of this water and discharge of clear water can be continued without interruption as long as the flood lasts.

The depth of the silt deposited by the floods is about 4 inches per year, the swampy bottom, consisting of marine mud and peat, will subside under the weight of the silt; consequently the warping will be slow; however, it is believed that the whole area of 12 350 acres will be reclaimed in about 30 years and will then provide excellent soil for agricultural purposes. Meanwhile the outside belt of the depression is already reclaimed and public health at Grosseto has already much improved.

The cost of the intake and canal is estimated at £ 160 000 and that of the whole work, including the drainage channels and regularization of the river and a navigable canal, at £ 800 000.

The Composition and Value of Bat Guano. — MILLER, C. F. (Bureau of Soils, U. S. Department of Agriculture, Washington) in *The Journal of Industrial and Engineering Chemistry*, Vol. 6, No. 8, pp. 664-665. Easton, Pa., August 1914.

The following results of a series of analyses of bat guano were obtained by the Bureau of Soils.

The notable variations of composition are due to: a) the presence of foreign matter, such as rock fragments, etc. (the Porto Rico samples were rich in lime); b) the loss of useful constituents by washing out and by decomposition and volatilization of nitrogen compounds.

The sample from Haiti is a pure bat guano of recent formation and practically undecomposed. It is calculated that this deposit contains about 100 tons valued at about £ 5 600, taking the price per ton as £ 8 approx., and on its chemical composition. This deposit exceeds the average in quantity and quality.

Analyses of Bat Guano (percentage of dry matter).

Locality	Nitrogen	Phosphoric acid	Potash	Total
Carlsbad, New Mexico	4.24	2.31	1.28	—
Guadeloupe Mts., N. M.	1.77	2.68	0.41	—
Torreón, N. M.	10.82	1.08	1.01	—
Oregon Co., Montana.	8.10	2.06	0.58	—
San-Juan, Porto-Rico	1.00	3.40	0.21	—
»	0.50	2.40	0.29	—
El Fondo, S. Domingo, Haiti.	13.84	4.80	1.61	—

No precise data relating to the area of bat guano deposits in the United States exist, but they are known to be very extensive.

880 - **The Solubility of the Various Constituents of Basic Slag.** — SIBOT, MARC and JORET, GEORGES (Yonne Agricultural Station) in *Journal d'Agriculture Pratique*, Year 78, Vol. I, No. 25, p. 78. Paris, June 18, 1914.

Besides phosphoric acid, basic slag contains other elements (magnesium sulphur, manganese, iron, etc.), whose usefulness as soluble chemical manures has been recognized for some years.

The writers have endeavoured to find out to what extent these elements are soluble, both by Wagner's reagent and by solution in various organic acids of such concentration that the acidity of the solution is equal to that of 2 per cent. citric acid (Wagner's reagent). The method was the same that employed in determining the citric-soluble phosphoric acid.

From their very numerous analyses, the writers have found that the elements studied (silica, phosphoric acid, lime, magnesia, sulphur, iron and manganese) exist in a form soluble in various weak acids; degree of solubility varies according to the fineness of the slag or to the actual solubility of the salts formed (citrates, malates, lactates, etc.).

The degree of solubility of the different elements varies as follows:

	per cent	
phosphoric acid	24	to 87.2
lime	48.4	to 89.4
magnesia	3.1	to 67.6
iron	10.8	to 41.4
manganese	7.7	to 39.7

Citric and malic acids have the greatest power of solution, and had acetic, tartaric and oxalic acids follow in order.

In the slags studied there are few insoluble silicates. The silica very soluble in weak acids, citric, lactic and malic dissolving about 90%

t. of the total. It appears that the solubility of this element varies with that of the phosphoric acid, as would be expected if these two elements in a state of combination as silicophosphate, as many writers affirm. The solubility of iron and manganese also appears to vary in the same proportions.

In conclusion, basic slag can be considered not only as a phosphatic manure but also as a compound manure.

Measures for Meeting the Shortage of Potash Manures in Great Britain.—

Leaflet of the Board of Agriculture and Fisheries. London, August 1914.

The Board of Agriculture and Fisheries desire to draw the attention of farmers and gardeners to the need for seeking new sources of potash manures, since the existing stock is very small and no further importation possible for the present.

The chief natural sources of potash immediately available are: 1) seaweed, and 2) weeds, prunings, hedge-clippings, brushwood, leaves and vegetable refuse generally.

Seaweed is already extensively used as a manure on the coasts, and those who have access to this source of supply should collect it in quantity. Sea weed (*Laminaria*) may be used direct as a manure; grassy weed tangle (*Fucus*, etc.) should be dried and burnt wherever possible. A ton of fresh seaweed should yield 20 to 30 lbs. of potash, or sufficient to manure from a quarter to half an acre of potatoes.

Inland farmers and gardeners may obtain potash by burning all kinds of vegetable refuse not suitable for direct application to the soil. The percentage of potash in vegetation varies very widely; among ordinary weeds for example, thistles might yield 5 per cent. and nettles 2.5 per cent. of their weight as potash; timber contains very little potash, cordwood in considerable quantity, and brushwood still more; ordinary wood ashes might contain from 5 per cent. to 10 per cent. according to their source. Ashes from the burning of weeds, prunings, hedge-clippings, etc., may contain from 10 to 15 per cent. of potash, i. e., corresponding to an equal weight of manure, which last spring sold at about £2 10s per ton.

It is absolutely essential, in the absence of full supplies of farmyard manure, that potash should be supplied to such crops as potatoes and (on light soils) turnips, and that it should be available in gardens for potatoes, cabbages, parsnips, onions and many other crops.

In many districts farmers might advantageously employ unemployed labourers in the collection and burning of all vegetable refuse. The ashes should be stored in a dry place and applied in the following spring.

Coloration of the Seed-Coat of Cowpeas.—MANN, ALBERT (Plant Morphologist, Bureau of Plant Industry, U. S. Dept. of Agriculture) in *Journal of Agricultural Research*, Vol. II, No. 1, pp. 33-56, 2 figs. Washington, April 15, 1914.

This study was undertaken to determine the possible relationship between the arrangement of the various layers of pigment and the hereditary colour in the seed coat, and to verify the supposition that colours optically alike are, in some cases, different in the constitution of the pigment.

and place of deposit. The subject is dealt with under the following heads: Methods of Preparation, Morphology of the Seed Coat, Pigmentation of the Basal Colour Layer, Pigmentation of the Palisade Layer, Seed Destitute of Pigmentation, Classification of Colour Factors in Cowpeas, Classification based on Distribution and Kinds of Pigments (1. Cowpeas having no pigment in the palisade layer; 2. cowpeas having only anthocyanin in the palisade layer; 3. cowpeas having only a melanin-like pigment in the palisade layer; 4. cowpeas having both a melanin-like pigment and anthocyanin in the palisade layer).

The writer summarises the results as follows. The greatly diverse colour schemes of the different varieties of cowpeas may therefore be reduced to two factors: 1) an extremely uniform basal colour, ranging from very pale yellow to deep copper red, but found to be in all cases due to a melanin-like pigment deposited in the basal colour layer, the difference in tint being unquestionably caused by differences in quantity rather than in character of the pigment present; and 2) a superimposition on this basal colour of variously arranged pigment areas in the palisade layer, the outer layer of the seed coat, the pigments here being of two kinds, first, a melanin-like pigment very generally identical in colour and behaviour to that found in the basal layer, and, second, an anthocyanin pigment, either associated with this or found in separate cells.

This anthocyanin pigment may be of a red or blue colour according to the reaction is acid or alkaline, and these two colours may be found in the same cells or in separate cells. Finally, according as only one or more than one or all of these pigments are present in the palisade layer, or according as they are uniformly distributed throughout its cells or are variously localised in large or small areas of its cells, we get the remarkably diversified blotching, streaking, speckling, marbling or monochrome coloration which characterise the different varieties of cowpeas.

In cases where the seed coat is white or cream coloured, or has a white area, or, even where there is merely a slight speckling, the palisade cells show great distortion of outline and unevenness in the cell cavity. Again, in most parti-coloured cowpeas of strongly contrasted tints, strongly coloured areas have perfectly regular, symmetrical palisade cells while the lighter areas are more or less strongly contorted in form and irregular in the cell cavity. In other words there is a decided correlation between the morphology of the palisade cells and the suppression of the pigments in these cells.

88: - **Palms Indigenous to Cuba.**— BECCARI, ODOARDO, in *Pomona College Journal of Economic Botany*, Vol. II, No. 2, pp. 253-276, and No. 4, pp. 351-377; Vol. No. 1, pp. 391-417. Claremont, California, March and December 1912; February 1913.

List and botanical description, accompanied by figures, of palms indigenous to Cuba and neighbouring islands. Twenty-five species are described, of which two belong to the family *Coccoloba*, six to *Attalea* and the majority of the rest to *Corypheae*. The writer concludes with an account of the mode of growth of the trunk of palms.

The Influence of Pressure on the Structure of Roots. — MOLLARD, MARIN, in *Revue Générale de Botanique*, Vol. 25 (bis), pp. 529-538. Paris, 1914.

The roots of plants growing in soils on schist formation often penetrate between two strata and become subjected to considerable pressure, which results in malformation. The writer summarises the anatomical characters of such roots as follows:

- 1). The cells are narrower.
- 2). The living cells are only slightly deformed, whilst the older ones, such as the wood vessels, are flattened out.
- 3). Cell division ceases beyond a certain pressure, but without the life of the cells being destroyed.
- 4). The xylem and phloem elements grow chiefly in a direction parallel to the plane of the pressure.
- 5). Differentiation of secreting canals may cease.
- 6). The fibrous tissues are largely or entirely suppressed.
- 7). The two extremities of the compressed portion of the root become atrophied.

These observations were made on material of *Carlina corymbosa*, *Helianthus Crocata*, *Plantago maritima* and *Hedera Helix*.

The Aroma of Hops: Studies of the Essential Oil and its relation to Geographic Distribution of Hops. — RABAK, FRANK (Chemical Biologist, Drug-Plant and Poisonous Plant Investigations, Bureau of Plant Industry, U. S. Department of Agriculture), in *Journal of Agricultural Research*, Vol. II, No. 2, pp. 115-159, 14 figs. Washington, D. C., May 1914.

The writer has made determinations of the following properties: specific gravity, optical rotation, refractive index, solubility in pure or in alcohol, boiling point, ester value, acidity, saponification index. Comparisons have been made of hops from the United States (California, Oregon, Washington, New York) with hops from Bohemia (Saaz) from authenticated sources during four consecutive years.

The volatile oil was prepared by distillation in a current of vapour. The average yield of essential oil varies considerably for a given locality from one year to another. The specific gravity of the essential oil from recent Californian hops was almost constant during the same season, varied very little from one year to another. A similar observation was made with regard to the refractive index. The averages of numerous determinations obtained during several years are given in the following table. The data relating to Californian hops are from samples from five different sources.

The writer concludes from his results that the volatile oil of hops consists chiefly of: 1) myrcene; 2) esters consisting of compounds of heptanoic (myristic), octoic (or caprylic), nonoic (or pelargonic) acids in combination with myrcenol (alcohol); 3) humulene; 4) traces of free acid; 5) aldehyde. The various essential oils examined contained different proportions of ester, myrcene and humulene. Although not much importance is attached to the two latter constituents, the variations of strength between them are very significant in relation to the aroma.

The chief chemical and physical properties of the essential oil of hops

Origin	Essential oil, per cent.	Specific gravity	Refractive Index at 20° C.	Volume of ess. oil, soluble in 3 vols. of alcohol at 94° C. (1909)	Index of acidity	Ester value
California .	0.324	0.8326	1.4775	0.8	1.41	45.6
Oregon . . .	0.290	0.8385	1.4745	1.0	2.70	58.8
New York .	0.192	0.8554	1.4753	0.8	3.25	50.9
Washington	0.370	0.8482	1.4748	0.9	1.25	54.8
Imported .	3.310	0.8433	1.4862	0.75	2.02	23.5

Important differences in the constitution of the essential oils are not only in hops of the same season and from different districts, but from the same districts during several seasons. These differences are very prominently in the curves of the chemical and physical properties. The curves of fractional distillation representing a partial quantitative separation of the principal constituents show very clearly the relation between the hops of a particular district during the different seasons. The curves of optical rotation also show this relation very clearly. Generally, the physical properties (fractionation, specific gravity, and optical rotation) show the existence of strong resemblances between the essential oils of the same type and strong differences between oils of different types.

Since the esters are the most important constituents affecting the flavor of hops, the various hops have been compared by means of the ester value of their essential oils after distillation. The curves of the ester value of different essential oils and their fractions show at once the different geographical distributions. All hops from countries other than North America were always deficient in esters.

The essential oils of hops from California are very similar from year to year with regard to their physical and chemical properties. The hops from the various parts of California are very analogous and show parallel curves each year. The essential oils of hops from Oregon and Washington are very analogous, but show slight differences from those of California. The hops from New York State resemble foreign varieties in regard to essential oil, but are richer in esters. Arranged in the order of increasing strength in esters they are as follows: imported hops, Californian, Washington, New York, Oregon, the last three being almost identical.

It has not been possible to establish any relation between the ester value of the essential oil and the quality of the hops, though this shows a distinct relation to the place of origin in every case. A bibliography of twenty-seven works is appended.

Fenugreek Seeds. — WUNSCHERDORFF (Chief of works of the Faculty of Medicine and Pharmacy at Algiers), in *Journal de Pharmacie et de Chimie*, Year 106, 7th Series, Vol. X, No. 4, pp. 152-153. Paris, August 16, 1914.

Fenugreek seeds are exceptionally rich in nitrogen and phosphorus, former in the form of albuminoids, the latter in the form of phytin, co-albumin, and especially lecithin (1.5 to 1.7 %) which is present in greater quantity than in any other seed. The flour obtained from the triturated seeds contains 5.81 % of nitrogen, corresponding to 36.3 % of albuminoid matter, 1.042 % of phosphoric acid, of which 0.135 % is in the form of lecithin, 0.758 % as phytin, and 0.149 % as nucleo-albumin. These seeds are therefore of high nutritive value. They were used by the ancients in recuperating the constitution and are now used by the natives of North Africa as a protection against disease, an extract being used as a febrifuge. The writer confirms their food value but doubts their medicinal value. The bitter flavour and disagreeable odour after eating is much against their use. The writer has found that this disagreeable odour is due to a diastatic action taking place during the final stage of ripening of the grain, and that it disappears on germination. Treatment with boiling alcohol and rapid drying at low temperatures destroys the odour and enables them to be preserved indefinitely in air-tight tins.

The Assimilation of Atmospheric Nitrogen by Plants. — KÖVÉSI, FRANÇOIS, *Revue générale de Botanique*, Vol. 25 bis. (Researches in Vegetable Biology: dedicated to GASTON BONNIER by his pupils and friends on the occasion of the 25th anniversary of the foundation of the Laboratory of Plant Biology at Fontainebleau), pp. 405-415. Paris, 1914.

The writer confirms the previous conclusions concerning the utilization of the free nitrogen of the air by plants (I). Plants were grown under the two following conditions: 1) in an atmosphere without nitrogen (sterilized); 2) in the open air. The two series gave the same reactions, viz. the presence of protein in the hairs, particularly in the specialized hairs studied by JAMIESON, and by ZEMPLÉN and ROTH, who attribute to them the power of absorbing and fixing nitrogen from the air.

Various protein reactions were applied, from the results of which the writer draws the following conclusion: The presence of protein in the hairs of plants grown in a nitrogen-free atmosphere shows that it is due to growth and normal nutrition, and not to a direct assimilation of atmospheric nitrogen. Thus the theory of Jamieson, Zemplén and Roth, that the protein in the hairs is formed only from atmospheric nitrogen, is tenable.

Physiological Researches on the Germination of the Pollen of *Vitis vinifera*. — CARINO CANTINA, E., in *Le Stazioni Sperimentali Agrarie Italiane*, Vol. XLVII, Part 7, pp. 480-492. Modena, 1914.

From a study on the germination of vine pollen, the following conclusions have been drawn:

- 1) The pollen grains of the vine require an acid medium for develop-

*) See No. 1113, B. April 1911.

ment, in accordance with the strongly acid reaction of the sap of plant.

2) The most suitable medium for laboratory experiments is one containing 15 per cent. saccharose, 2 per cent. gelatin, and tartaric acid: proportion 1 : 4000.

3) Prolonged rainy weather, by diluting the stigmatic secretions may cause the pollen grains and tubes to burst, as is the case when germination is effected artificially in distilled water.

4) Temperatures outside the limits of 14° C. and 35° C. during flowering period produce sterility, owing to the absence of germination below 14° C. and to the abnormal development of the pollen tube above 35° C.

5) Many of the fungicides used on vines are injurious to the grains.

6). The grower should have no difficulty in choosing between the possible danger of sterility and the certainty of infection by oidium mildew.

889 - **Thirteen Years of Wheat Selection.** — HUTCHESON, T. B. (Associate Agronomist, University of Minnesota), in *The American Naturalist*, Vol. XLVIII, No. 374, p. 466 + 3 tables. Lancaster, Pa., August 1914.

In 1901 the Minnesota Agricultural Experiment Station planted a number of varieties of wheat from the *polonicum*, *spelta*, *turgidum*, *induratum*, and *vulgare* types. Six of these varieties (one each of *turgidum*, *induratum*, *spelta* and *durum*, and two of *polonicum*) have been grown continuously and selected by the centgener method. This method consists in planting one hundred selected kernels from each plant, at equal depths and at equal distances apart in separate plots. Careful notes are taken of the plants of each centgener, and at harvest five or more of the highest yielding plants are selected, from which the seeds for planting the next year are taken. From these five best plants, from five to ten of the best are selected and thrashed together. One hundred of the largest and plumpest kernels are selected and planted in the centgener test plot the next year. This operation is continued from year to year.

In 1908, an experiment was planned with the object of developing a strain of wheat which would have a minimum amount of culm exposure between the base of the spike and the upper leaf sheath, i. e. a short-necked variety of wheat. The ultimate purpose of this was to reduce the portion of the stem exposed to the black stem rust, which does not attack the portion of the stem enclosed in the leaf-sheath. For this work individual plants were selected which had short necks and the seeds from these were planted in separate centgener plots. A continuous selection of short-necked plants was made during the succeeding years.

Each centgener was started from a single head in 1901, and since wheat is normally self-fertilised, these heads have bred true to type. Thirteen years of selection in one pure line is the longest period of continuous selection yet reported for a self-fertilised plant, thus making these data of considerable importance.

bles are given showing the results of selection for increased yield (1913), for increased height (1901-1913) and for short neck (1909-1913). The data presented in these tables it is evident that there has been permanent gain for these thirteen years of selection, either in yield per height of plant, or shortening of neck-length. Only the expected variations occur, which were the same, with regard to production, in continuous open field experiments without selection. A comparison of the yield of each variety for the first five years of the height that of the last five years is shown in the accompanying table, which shows that there is no significant difference in yield for these two

Variety.	First 5-year period.		Last 5-year period.	
	Height.	Yield.	Height.	Yield.
	in.	gms.	in.	gms.
<i>turgidum</i>	41.6	2.67	38.4	2.34
<i>vulgare</i>	38.0	1.99	35.4	2.18
<i>alba</i>	40.0	2.51	39.2	2.40
<i>durum</i>	36.4	2.01	35.8	1.97
<i>polonicum</i>	39.9	1.54	37.4	1.61
()	33.4	1.62	33.4	1.31
Average	38.2	2.06	36.5	1.97

from the practical breeder's standpoint permanent improvement in the size of small grain, if possible, is certainly not rapid or apt to be marked. It is probable that much more rapid progress could be made by segregating pure lines from mixed populations and combining desirable characters of these lines by hybridisation.

Note on the Selection of Maize in Cambodia.— DR FLACOURT, MARTIN (Chief Agricultural and Commercial Service in Cambodia), in *Bulletin économique de l'Indochine*, Year 17, No. 107, pp. 215-218. Hanoi-Haiphong, March-April, 1914.

Maize is extensively grown in Cambodia chiefly as food for the inhabitants and it generally precedes rice in the rotation. There are two chief varieties: one with orange yellow grains, the other with milky white grains, vegetative periods being 90 and 105 days respectively.

The writer proposes selecting local varieties with a view to improving earliness. These two varieties show considerable variation as regards position of the grains and number of secondary tillers, and sometimes pale green or white striations on the stem and leaves. These variations cannot be explained by hybridisation alone, but would seem to be a tendency to mutation amongst some individual plants.

In these experiments the writer found that the variation was increased by exposing the ripe ears freed from the sheath for several days, thus

causing a cracking of the grains similar to that produced by the mechanical process employed by BLARINGHEM. The present pedigrees are too small to enable conclusions to be drawn.

It was also found that the secondary shoots, in many cases, flower at the same time as the main shoot, and though some 20 to 23 days younger than the latter, they ripen their grains at the same time, thus having a shorter vegetative period. The inflorescences of the secondary shoots are of three different forms: 1) they are exclusively unisexual, 2) the female inflorescence is normal in type but surrounded at its base by small male flowers, 3) the terminal panicle carries both male and female flowers. Seeds were selected only from the best grains produced by the normal inflorescences of the secondary shoots, and it is found that the earliness of maturity of these seeds is inherited by the descendants.

Plants were also raised from seeds from the abnormal inflorescences of the last two types; they produced perfectly normal male and female inflorescences with the same degree of earliness of maturity.

891 - *Innovation in the Danish Trade in Seeds of Root Crops.* -- From a Communication by H. HELWEG, Director of Experiments at Copenhagen.

In Denmark the State has for a number of years carried out trials in root crops, for which any Danish seed breeder can enter his strains of seeds. According to the results the strains are divided into three classes. The names of the breeders of the first class seeds are published. Owing to the great demand for seeds on the part of the trade, prices rise very high and this stimulates the breeders to further exertions. Thus 10 s a lb is now paid for pedigree mangold seeds and 20 s a pound for turnip and swede seeds.

This cooperation of State, breeder and seedsman has already led to an increase in the yield of Danish root crops.

Of late years the practice has been introduced of selling seeds of root crops with a guarantee as to their quality, as has long been done for grass seeds.

For both root-crop seeds and grass seeds the value of the crop depends upon the genuineness of the seed, but with this difference, that the genuineness of grass seed can be recognized by examination, while the genuineness and strain of root-crop seeds cannot; the analysis of the latter carried out by the seed control stations has therefore little value, whereas in the case of grass seeds it is so useful that it has become customary to base the price upon it. It is further to be noted that the analysis of a parcel of grass seeds can be controlled by another examination in spring, while the genuineness of the root-crop seeds can only be checked in the autumn by an examination of the roots in the field in which the seed was sown in spring.

Complaints as to the quality of the seeds sown in spring are taken up to the 15th of October of the same year.

In the spring of 1912 the guarantee for genuineness of Danish root-crop seeds was introduced into the home trade and in 1913 into the foreign trade. Not all the wholesale seedsmen have adopted the guarantee system.

in transactions, but they must henceforward mention it expressly in business papers, etc.

For the settlement of possible disputes concerning the guarantee, the official (of the Weights and Measures Bureau) takes an average sample of the seeds sold under such guarantee and sends it to the State Commissioner for root crops, who has all the samples sent in sown in a control recognized by the State. Complaints from abroad are to be brought before the Maritime and Commercial Tribunal of Copenhagen, which appoints two or three experts to examine the roots produced in the above way. The seed in question, and if the seeds delivered do not correspond to the description the amount of compensation due is determined on the basis of the test made in the experiment field.

The Longevity of Some Common Seeds. — EASTHAM, ALFRED (Chief Seed Inspector, Department of Agriculture of Canada, Seed Branch) in *The Agricultural Gazette of Canada*, Vol. I, No. 7, pp. 544-546. Ottawa, July 1914.
Researches on the longevity of seeds were begun in 1903 and will be continued until the vitality of the seeds has been entirely lost. Seeds of

	Germinating capacity after:			
	1 yr.	5 yrs.	7 yrs.	10 yrs.
<i>Alfalfa:</i>				
of 12 samples harvested in 1903	97	90	83	56
of 12 samples harvested in 1904	93	90	85	52
<i>Clover:</i>				
of 12 samples harvested in 1903	97	76	61	44
of 12 samples harvested in 1904	96	75	68	43
<i>Red clover:</i>				
of 12 samples harvested in 1903	93	79	66	45
of 12 samples harvested in 1904	93	81	72	45
<i>Barley:</i>				
of 33 samples harvested in 1903	94	95	after 10 yrs. 93.5	after 13 yrs. 91
of 64 samples harvested in 1904	98	97	96	—
of 63 samples harvested in 1905	95	97	97	—

from the various provinces of Canada.

high germinative capacity were chosen and stored in sealed boxes in the Seed Branch Laboratory of the Department of Agriculture. The results are shown in the accompanying table.

893 - **The Influence of External Physical Agents on the Germination of Wheat** — 1. LOYER, HENRI. — 2. RIVIÈRE, C. — *Bulletin de la Société Nationale d'Acclimatation de France*, Year 61, No. 14, pp. 417-456. Paris, July 15, 1914.

1. — The writer states that the influence of physical agents on germination requires a more precise investigation and that many problems remain to be solved in regard to aeration, moisture and temperature. For example: the limits of rarefaction and pressure between which germination is possible, the gradual reduction of germinative power, the maximum and minimum quantities of water favourable to germination, the correlation of data relating to the duration of germination in relation to temperature. The writer points out that the temperature data obtained by the methods of RÉAUMUR, DE GASPARIN, DE CANDOLLE, TISSIER are not concordant, since they show great differences for the same vegetative period of the same plant. He proposes a method of his on which appears to give better results.

The sum-totals of the daily means of the squares of the hourly temperatures always give the same result for the germinative period of the same plant. In the case of wheat, for example, the number always approximates 1500, provided that the squares of temperatures above 20° C. are reckoned as 400 and that only the temperatures between 0° and 20° are included in the actual values.

The writer considers that these generalisations are common to plants and intends to verify them in cases other than wheat.

II. — The following comments have been made by M. C. RIVIÈRE.

These experiments have the advantage of being carried out under precisely controlled conditions, the same plant being used throughout since each variety requires certain variable meteorological conditions to complete its development. The results are interesting, but some indication, however approximate, should be given of the meteorological conditions affecting germination, such as soil temperature, illumination and humidity.

Rise of temperature, for example, does not always coincide with increased illumination, and the more rapid development of wheat in north Europe near the arctic regions is due more to increased illumination than to the temperature. Thus, the intensity of light during the night should be taken into account. Further, what method of computation can take into account all meteorological influences?

There are also meteorological influences which are difficult to determine. Since our determinations of meteorological conditions are as yet only rudimentary compared with the complexity of the subject, all conclusions should be considered as arbitrary only. The method of M. LOYER will tend to narrow down the problem. It is possible to determine the number of calories necessary for the germination of wheat by experiments *in vitro* with temperatures controlled and automatically recorded, but the results thus obtained are so far removed

natural conditions that they are useless to determine the actual biological conditions conducive to good or bad germination. This problem which still awaits solution.

Studies on the Pollination of Lucerne in its Relation to Seed Production. — TIER, C. V.; EVANS, MORGAN W.; MCKEE, ROLAND, and MORSE, W. J., in *Bulletin of the U. S. Department of Agriculture*, No. 75, pp. 32 + 1 fig. Washington, April 8, 1914.

In the regions of the United States where lucerne is grown for seed, the yield varies considerably from one season to another. Thus, in Milk Valley, California, in some seasons the yield has reached 10 to 12 bus. per acre, but in others it has been practically nil.

With a view to finding the cause of this difficulty the Department of Agriculture in 1906 undertook a series of experiments at several stations. The problem was found to be a most complex one, depending not only on the abundance of insects for pollination, but also on the climatic conditions. Under certain climatic conditions autogamous pollination is sufficient to insure a certain factor from one season to another and among different individual plants. The factors or conditions favouring the production of seed vary during the season, as is seen from the occurrence of pods amongst mature plants. On several occasions, especially during the first cut, it has been seen that artificial pollination by agitation of the stamens does result in fructification.

The writers review the work of previous authorities on the structure and function of the flower of lucerne, showing conclusions at variance with each other. Only in some cases are direct attempts made to determine the relation between pollination and the quantity of seed harvested. The prevailing opinion is that pollination by insects is of vital importance, but that if they are not present in sufficient numbers, the yield of seed is reduced. The importance of the climatic conditions is generally recognized, and it is pointed out that commercial seed is produced in regions of a semi-arid climate, at least during the ripening period.

The flowers of lucerne may be pollinated at any time from the opening of the flower to the fall of the petals. Pollination generally takes place after the release of the staminal tube, which is effected by a special mechanism. The staminal tube is held by two opposite lateral protuberances inside the keel.

Heavy insects such as the bumble bee are able to press the sides of the keel apart, thus liberating the staminal tube. Generally, however, the liberation is effected by the insect inserting its proboscis between the anterior edges of the keel. More often the two posterior appendages of the wings, which meet above the staminal tube, are displaced, thus causing direct distension of the keel. The presence of this spring-like mechanism has been observed in twenty species of *Medicago*, also in *Alysicarpus*, *Ononis*, *Indigofera* and *Genista*. The writers have not been able to confirm BURKILL's theory, that the release of the staminal tube causes a rupture of the stigmatic cells and promotes fertilization. Liberating the staminal tube by artificial means, so as not to stimulate or rupture the stigmatic cells by contact, gives as good results as natural pollination.

Flowers which are artificially exploded and thereby self-fertilized produce an abundant crop of seeds. In a series of experiments on 77 plants conducted in 7 different places, 9074 flowers produced 2784 fruits (or 3 per cent.) when mechanically self-fertilized, whilst 8939 flowers on the same plants fertilized under natural conditions yielded 1499 fruits (or 1.7 per cent.). The fruits from flowers artificially exploded contained an average of 1.72 seeds each, whilst the fruits of flowers naturally fertilized contained 2.22 seeds.

Cross-pollination among flowers of the same plant is not more productive of seeds than self-fertilization, but pollen from other plants increases the proportion of fruits and the number of seeds per fruit. There is a considerable difference between the pollen of like or of dissimilar varieties.

The explosion of lucerne flowers normally takes place automatically but may be caused by insects or other agents. Flowers which fail to explode rarely produce fruits and seeds. Two plants were observed at Chiswick, Mont., in 1909; one had 57 flowers, of which 33 exploded automatically and set 21 fruits; the other had 64 flowers, of which 36 exploded automatically and set 16 fruits. The percentages of fruits formed from these flowers were therefore 37 and 25 respectively. These figures are as high as those obtained under natural conditions in the fields. In a similar experiment conducted at Pullman, Wash., in 1910, only 21 out of 775 flowers laid themselves produced seed, or 2.7 per cent., against 13.15 per cent. in open.

There is considerable variation in the rapidity with which the flowers of lucerne explode automatically or by means of exterior agents, and their subsequent fructification. The number of fruits is not proportional to the number of flowers, since the largest inflorescences are less likely than the smaller ones.

Automatic fertilization of the flowers takes place more frequently during warm sunny weather and is influenced considerably by the humidity. Pollination can be immediately effected by placing the flowers at the focus of a converging lens or by exposing them to the sun on a warm day. Insects are the natural agents of cross-fertilization of lucerne, but good yields of seed can be obtained in places where they are rare. Bumble-bees and *Megachiles* are the most effective insects for effecting the dispersal of the pollen. Bees collect honey from these flowers and effect pollination in only a few cases. Nocturnal insects are of negligible importance. There is no evidence to show that butterflies are able to effect pollination; wind and rain are of slight importance.

Automatic explosion of the flower and consequent self-pollination is as effective in producing seed as insect pollinizers, at least in the Western States. This conclusion agrees with the observation that excellent crops of seed are obtained in regions where humble-bees and other suitable insects are rare.

Alfalfa in the United States. — BROOKS, WILLIAM F., in *Massachusetts Agricultural Experiment Station, Bulletin* No. 154, pp. 147-171 + 2 tables. Amherst, Mass., 1914.

This is a bulletin of instruction and propaganda intended for practical farmers. Part of the directions are based upon the experimental results obtained either by the writer at the Amherst Agricultural Experiment Station or by thirty-three farmers in different parts of the State.

Alfalfa is now successfully grown in most parts of the United States and in a few parts of Canada. It is popularly supposed that alfalfa is superior in nutritive value to clovers, but so far as can be determined by chemical analyses made at the Amherst Station and determinations of digestibility made there and in other stations, this does not appear to be the case, as may be seen from the following tables :

TABLE I. — *Composition of Clover and Alfalfa Hays.*

	Water %	Ash %	Protein %	Fibre %	Nitrogen free extract %	Fat %
alfalfa hay	13.24	6.38	13.98	28.48	34.70	1.40
clover hay	15.00	9.70	14.00	23.10	36.10	2.10
red clover hay	15.00	9.70	13.30	24.30	37.20	2.50

TABLE II. — *Digestible Nutrients and Energy Values (*).*

	Protein (lbs. in 100)	Fibre (lbs. in 100)	N-free extract (lbs. in 100)	Fat (lbs. in 100)	Net energy value (Therms)
alfalfa hay	10.2	13.9	24.4	0.5	34.9
clover hay	9.2	11.6	23.8	0.8	34.6
red clover hay	7.7	13.1	24.2	1.4	35.6

* Based upon average results in the United States.

The writer does not recommend the direct application of manure in preparing the soil for alfalfa, but advises instead the free use of it on the feeding crops. Sometimes, however, the direct application of potash, lime or phosphatic fertilizers may be advisable. In the writer's experiments sulphur in the form of sulphate appeared much superior to potash in the form of sulphate.

Some varieties of alfalfa introduced from Siberia by the South Dakota Experiment Station have not yet been sufficiently tested. The best of common alfalfa grown in the United States are those from the northern districts; Grimm's alfalfa is a selected strain which originated in

Minnesota and is noted for hardiness and productiveness (1). In some experiments conducted by the writer with Grimm and common alfalfa, the former yielded an average produce in 3 cuts per year for two years, of 3.26 tons per acre against 3.261 tons of the latter, or a difference of about 22 per cent. in favour of the Grimm.

The variegated alfalfa is said to be a cross between common alfalfa and yellow lucerne. This variety is said to be more hardy than ordinary alfalfa and adapted to poorer soils: it has, however, a tendency to decumbent growth, and a lower feeding value.

Hitherto few diseases have proved troublesome to alfalfa in Massachusetts; the only important ones are leaf-spot (*Pseudopeziza Medicagoe*) and dodder.

Two experiments in inoculation with "Farmogerm" culture (prepared by the Earp-Thomas Farmogerm Co., Bloomfield, N. J.) were made and gave good results on land which was put under lucerne for the first time.

896 - **Methods of Propagation of Olives** (2). — CAMPBELL, C., in *Le Stationi Sperimentali Agrarie Italiane*, Vol. XLVII, Part 4, pp. 297-307. Modena, 1914.

The writer draws the attention of olive growers to the importance of methods of propagation. The seeds of the wild varieties of olive have the highest germinating power, but the growth of cuttings (as shown by the writer's experiments) is more vigorous in the case of cultivated varieties and improves as the number of asexual generations increases.

Of the various methods of asexual reproduction, e.g. by cuttings, by "ovoli" (3) and by grafting, the last-named method is destined to be of the greatest importance in the future. Reproduction from seed is seldom practised, since the number of seeds which germinate is small, and each seed requires subsequent grafting. The writer remarks that it is possible to improve the germination of the seeds, which is more vigorous in the hard and semi-wild varieties. The seeds from trees grown directly from seed are more vigorous in germination than seeds obtained from grafted trees. New varieties obtained in this way, using seeds of the best varieties, yield seeds with a higher percentage of germination. Since it is necessary to choose vigorous plants as stocks, especially for arid and infertile soils, the writer recommends the sowing of seeds of cultivated varieties so as to produce stocks more suitable for receiving the grafts of their own varieties or others of similar vigour. It will then be possible to undertake on an extensive scale the selection of different varieties, at the same time obtaining useful stocks.

(1) See No. 2106, B. July 1911.

(2) See Nos. 2668 and 2669, B. Aug.-Sept.-Oct. 1911; No. 1046, B. Sept. 1915.

(3) Excrescences formed at the bottom of the trunk; these are cut off and planted in the ground like cuttings. (2A)

Olive Growing in Syria. — AARONSOHN, A. (Director of the Jewish Agricultural Experiment Station, Haifa, Palestine), in *Revue Agricole et Viticole de l'Afrique du Nord*, Year 12, No. 120, pp. 607-609 + 3 figs. Algiers, June 27, 1914.

Olives are generally well looked after in Syria, and particularly so about Mascus. The exorbitant prices of irrigated land in this neighbourhood make intensive methods a necessity, and the olive comes in for its full share of attention. While in Palestine grafting is carried out on wild stocks, nascus (as at Sfax, for example) cuttings from old trees are grown on their own roots; to promote the growth of shoots from the old stems, the roots are earthed up. Grafting is only performed when it is desired to change variety.

In preparing the land the soil is not deeply dug over, but very large stones are prepared for the trees, and a layer of stones is placed in the bottom of the drainage.

When very old trees are transplanted. They are cut back almost to the trunk, or at any rate to the oldest branches, and the stumps are dressed with a mixture of clay and dung; the trunk is surrounded by bundles of reeds or straw and a layer of clay and cow-dung. Trees treated like this remain inactive for two or three years, but once they begin to develop rapidly and when irrigated begin to fruit in 3 or 4 years. The trees are planted 16 to 22 yds. apart. When they reach several years old, young fruit trees (chiefly apricots of late years) are planted between the rows. When the fruit trees come into bearing, the old olives are removed, realizing about £ 2 each as timber.

The variety most commonly grown is the Dâni, with small fruit; 'assa' abi yields large fruit suitable for preserving; the 'J' lette yields fruit which is consumed in the green state.

Analyses carried out at the Haifa Experiment Station gave the following figures:

	gms.
Average weight of an olive	3.37
Weight of kernels from 100 gms. of olives	21.75
oil	27.97
pulp	78.75

Pruning, which is little else than trimming, is practised in the Dâni district. The fruit is knocked down by means of long poles.

Olive Growing in in the District of Tizi-Ouzou, Algeria. — HMPOLYTE, L., in *Revue Agricole et Viticole*, Year 12, No. 124, pp. 88-91. Algiers, July 25, 1914.

The western and eastern slopes of the Djurjura chain of mountains are covered with ancient olive groves, the majority of which belong to Kabyles. The French colonists, encouraged by the bounties for planted grafting olives granted by the Algerian government, have also begun to plant. The cultivation practised in Kabylia is only ploughing and weeding. The importance of pruning is not understood by the native and is not practised and then without method. Manures are not applied, and the collection of the fruits is effected by means of poles 2 to 3 yds.

long, which damage the fruits and branches, thus reducing the value of the next year's crop. The writer has introduced a sort of wooden cage used in some parts of Italy, which enables the fruits to be collected with less damage to the trees.

In the case of the very bushy trees growing in an almost natural condition in the mountains, the first thing to be done is a good thinning. The harvesting of the fruit should be regulated for each district, as the growers are apt to start picking too early, with the result that an inferior crop is produced.

There are two varieties of olives in Kabylia, the Chembal and the Fagette, the latter being more common. The western slope of the Djurdj is favoured by abundant rain, averaging 45 to 50 inches per annum. The conditions are very favourable to the future welfare of the industry in the region. The adoption of modern rational methods would result in immediate improvements and a yearly crop instead of one every other year.

899 - **The Aleurites of Tonking.** — LEMARIE, CH., in *Bulletin économique de la Chine*, Year 17, No. 107, pp. 144-150. Hanoi-Haiphong, March-April, 1914.

The writer gives a description and botanical analysis of the species *Aleurites* of Tonking, with references to others from China and Japan. The "Cây-trau" of Tonking was first described as *A. cordata* Muel. Arg.

Eberhardt recorded *A. Fordii* Hemsl. as occurring in the mountainous province of Tonking. The only species found by the writer in the lowland and forest regions are *A. triloba* Forst. (*A. moluccana* Willd.) or "cây-lai" and *A. montana* Wils. or "cây-trau", of the latter of which he gives a botanical description.

E. H. Wilson (*Bulletin of the Imperial Institute*, Vol. XI, No. 3), mentioned that the species which yield a drying oil used for waterproofing objects, varnish, linoleum and rubber substitutes, etc., occur on the continent, while the Japanese species, *A. cordata* Muel. Arg., yields a burning oil.

Enormous quantities of drying oil are exported to Europe and America. Thus, in 1900, more than 330 328 pikuls (about 44 million lbs.) of oil obtained from *A. Fordii* were exported from Hankow, valued at 2 539 Haikwan taels (about £ 320 000), and in 1910 as much as 757 959 pikuls (about 100 million lbs.) valued at 6 449 421 taels (or £800 000). The exports from Outcheon during the same period increased from 24 469 pikuls (or 3 million lbs.) of oil from *A. montana*, valued at 146 813 taels (£19 000), to 52 106 pikuls (7 million lbs.).

A. montana Wils. is limited to the subtropical regions in the southwest of China, from Fukien to Annam. *A. Fordii* Hemsl., which represents more than $\frac{9}{10}$ of the total production of oil, belongs to the warm temperate regions of the Yangtse basin. *A. montana* is much more productive in Annam than in Tonking, where the writer suggests improvement of the variety by selection. He also recommends experiments with *A. Fordii* on the high plateaus of Tonking, as this species is more productive and the fruits are devoid of a ligneous seed-coat.

The Cultivation of the Sugarcane in the South of Spain. — *Royal Botanic Gardens, Kew, Bulletin of Miscellaneous Information*, No. 4, pp. 147-150. London, 1914. This article is based on information received from the British Consul at Málaga.

Sugarcane is cultivated in the sheltered valleys between Estepona and Málaga. The most profitable varieties are: Blanca, sometimes called Blanca, imported by the Arabs; Marada (violet) and Negra (black), only the same variety: Negra is said to have been imported from Canna cristalline, larger than the preceding but less rich in sugar. Striée, of inferior quality; Algarrobena, now almost entirely abandoned. The preparation of the land consists in heavy manuring and careful ploughing, breaking of clods, levelling, preparation of furrows 35 inches wide and about 8 inches deep, for the planting of the sprouted cuttings in May and April. They are planted in 3 lines so that the cuttings of one line alternate with those of the adjacent lines. They are covered with a layer of soil and gradually earthed up as they grow until the ground is level again. The land is kept free from weeds and in July or August chemical manures are applied followed by irrigation for 15 to 20 days until harvest. The plantation is renewed every 7 to 8 years or 12 years. The use of a complete chemical manure has become very prevalent of late years, as much as 1350 lbs. per acre being applied once a year during the season.

The average yield is 20 tons p. acre and the average sugar content of the district is 14 % and at Adra only 8 %.

Sugar-Beet Experiments in Ireland. — *Department of Agriculture and Technical Instruction for Ireland, Journal*, Vol. XIV, No. 3, pp. 471-482 + 4 figs. Dublin, April 1914.

In 1911 the Department of Agriculture and Technical Instruction in Ireland commenced a series of sugar-beet experiments with a view to comparing the relative yields and quality of roots grown close together on the flat in accordance with continental practice, and of those grown wider apart on drills or ridges, so that after-cultivation was facilitated; also to affording information as to the yields of this crop in the state in which it is purchased by sugar factories, *i. e.*, of roots properly topped and beets.

In the 1911 experiments the farmers reported very adversely on the results of growing sugar-beet on the flat, because it was more costly and more difficult to lift than when the beet was grown on drills. In order to ascertain whether the requirements of a sugar factory for roots almost entirely below the surface of the soil could be met by cultivating the crop on moulded-up drills, a third plot cultivated in this manner was added in the trials in 1912. Furthermore, in 1912 half of each plot was dressed with nitrate of soda. The experiments in 1912 were conducted at twelve centres in eleven counties.

In 1913 the experiments of 1912 were repeated: a) on drills 27 inches wide b) on drills 27 inches wide — the crop being moulded up after hoeing;

c) in rows 18 inches apart on the flat; d) with and without nitrate of soda at the rate of 1 ½ cwt. per acre.

The area of each plot was one-tenth statute acre: the variety of sugar beet used was Klein-Wanzleben Original Z.

The average yields of the three seasons 1911-13 (30 experiments in all) were as follows:

Ordinary drills:

Gross weight of roots	15 tons 9 cwt. per acre
Factory weight of roots	11 " 1 " "
Sugar content	17 per cent.

On the flat:

Gross weight of roots	16 tons 12 cwt. per acre
Factory weight of roots	13 " 2 " "
Sugar content	17.5 per cent.

From the above it is evident that the better crop in point of yield and also of sugar content was that cultivated on the flat, and that, moreover, the superiority of the roots on the flat would, at a price of £1 per ton to the farmer, more than recoup the extra cost of labour involved in the method of cultivation.

The average yields in 1912 and 1913 are shown in the following table:

Plots	Average annual yield of roots per acre		Ratio of factory weight to gross weight as percentage	Average sugar content, per cent.	Area of plot in square feet
	Gross weight	Factory weight			
	tons cwt.	tons cwt.			
Ordinary drills:					
a) Without nitrate of soda	13 6	9 8	68.1	16.5	89
b) With " "	15 1	10 3	67.4	16.1	89
Moulded-up drills.					
a) Without nitrate . . .	14 1	10 3	72.0	16.3	89
b) With " "	15 11	11 4	72.0	16.2	89
On the flat:					
a) Without nitrate . . .	14 14	10 17	73.8	17.0	89
b) With " "	16 10	12 1	73.0	16.5	89

From the above table it will be seen that, on the average of the three seasons, the flat plots *a* and *b* produced yields (factory weight) only 1 and 17 cwt. respectively per acre higher than the moulded-up drill plots *a* and *b*, and that the sugar content of the roots on the former plots was 0.7 per cent. and 0.3 per cent. respectively higher than that of the roots on the latter. These increments in yield and sugar content would

means be sufficient to compensate for the extra outlay in labour on the plots. It may therefore be inferred that of the three methods of cultivation that of moulding up ordinary drills is best adapted to Irish conditions.

It will be noticed also in the above table that the average increases in d (factory weight) due to the application of nitrate of soda were as follows:

On ordinary drills	15 cwt. per acre
On moulded-up drills	21 " " "
On the flat	24 " " "

that, on the average, the use of nitrate of soda slightly reduced the dry matter content of the roots (the reductions being 0.4, 0.1 and 0.5 per cent. respectively). Nitrate of soda had little, though varying, effect on the yield of the juice.

From the foregoing it would appear that the application of nitrate of soda to sugar-beet would not prove remunerative on fields manured as the best plots of 1912-13 had been. Some of them had 15 tons of farm-manure to the acre and 1 cwt. sulphate of ammonia, 3 cwt. of superphosphate and 6 cwt. of kainit, and others only chemicals, namely 1 ½ cwt. of ammonia, 4 ½ cwt. superphosphate and 6 cwt. kainit.

In some localities the sugar-beet plots were grown alongside mangolds with a view to comparing the relative yields. The general averages of nine experiments in the three years 1911-13, the yields of the best plots being 1, were the following:

Sugar-beets (gross weight) . .	17 tons	9 cwt. per acre
" (factory weight) .	13 "	10 " "
Mangolds	28 "	18 " "

The average yield of mangolds at the same time was 19 tons 3 cwt. per acre.

This shows also that the farmers who carried out these sugar-beet experiments were among the best. The inference to be drawn from these results is that, even when cultivated in the best manner, the factory weight of sugar-beet crop in Ireland cannot be expected to exceed about half the yield of a well-managed crop of mangolds.

- *Coffea excelsa* and its Cultivation. — CHEVALIER, AUG., in *Journal d'Agriculture Tropicale*, Year 14, No. 157, pp. 193-196. Paris, July 31, 1914.

The writer discovered this species of coffee in Central Africa and distributed seeds to several experiment stations, including those in Tonking, French Guinea and the Belgian Congo.

Native climate. — *C. excelsa* is found in the wild state at altitudes of 200 ft. in a climate which is dry for six months of the year and has an rainfall of at least 40 inches during the remaining six months. The summer temperature is tropical, whilst in December and January it falls below 60° F. at night. This type of climate occurs in a number of countries. It has been shown that this species succeeds well in equatorial regions, so that its cultivation is possible over wide areas.

Quality. — The coffee obtained from Central Africa showed a satisfactory strength in caffeine, and though somewhat bitter it had an excellent flavour.

Introduction in Tonking and Java. — In Tonking its growth has been remarkable and entirely free from insect and fungoid pests. The berry is small and uniform in size and it is hoped to sell it in competition with Arabian coffee blended with Mocha. Numerous specimens have been planted in Java in the Experiment Station at Bangilan near Malang and in the Tjikeumeuth Garden near Buitenzorg. Field cultivation has also been begun in the Dutch East Indies.

Selection. — This species is being improved by M. P. J. S. Cramer. It shows variation in almost all its botanical characters. In appearance it is less luxuriant than *C. liberica*, though it is hardier and earlier.

Cultivation. — This species is particularly robust in Java. It commences to flower in the second year and yields a crop of berries in the third year. The trees should be planted at least 12 ft. apart each way. Each tree is planted in the centre of a square plot cultivated and made to slope in the opposite direction to the general slope of the land and forming a hollow at the lower end, so as to prevent erosion of the surface soil. Young plants of "Iamtoro" (*Leucaena glauca*) are planted on the border of each square and periodically pruned so as to prevent the growth of old shoots. Sprouts of *Leucaena* 16 inches high are planted at the four corners of the square at the same time as the coffee plants. They are allowed to grow free until the fifth year, when they are cut down; as the coffee plants now cover the ground the *Leucaena* along the borders of the squares and six of those at the angles are removed so as not to shade the coffee too much.

Yields. — At Bangilan an annual yield of 616 lbs. per acre or about 3 lbs. per tree has been obtained. M. Cramer mentions the plantation at Kedatong (South Sumatra) where 54 plants of *C. excelsa* of 4 to 5 years growth yielded 7 lbs. per tree.

Market Value. — The value of the coffee approaches that of Liberian coffee and according to M. Boom it amounts to about £ 20 per acre. The beans require particular care since they are enclosed within a thin shell which must be completely removed before the highest prices can be obtained. Unfortunately only a small supply of the best strains exists and it is only at Bangilan that a uniform collection has been seen by the writer.

903 — **Studies on the Fertilization of Hops.** — TOURNOIS, JULIEN, in *Annales des Sciences Naturelles, Botanique*, Vol. XIX, No. 2 and 3, pp. 49-491 + 5 plates. Paris, 1901.

Investigations of the various phenomena in the sexual reproduction of *Humulus Lupulus* and *H. japonicus*.

I. **Appearance of flowers and differentiation of the sexual organs.** — The time of flowering depends strictly on external factors; changes, for example, of illumination, may cause considerable variation in the duration of the vegetative period.

The species of *Humulus* are generally dioecious, though apparently monoecious individuals occasionally appear. The transformation of dioecious plants is brought about by particular conditions, especially the

diminish the transpiration of plants, or tend to lower the osmotic pressure. It appears that a lowering of the osmotic pressure of male plants determine the appearance of female organs or flowers and that an increase of osmotic pressure in female plants may provoke, though more slowly, the development of male organs or flowers.

I. *Fertilization and formation of the embryo.* — The ovule of the common hop may be fertilized by foreign pollen, such as that of hemp and of the same hop, but in these cases the resulting seeds contain only irregularly developed embryos.

II. *Formation and constitution of the fruit or cone of the common hop.* — Fertilization is not essential to the development of the cones, but it stimulates their growth. The various morphological characters of the cone which form the basis of classification of hops, are liable to variation under different conditions and are of no more value than vegetative characters in distinguishing the varieties. Consequently the species *H. Lupulus* is to be considered homogeneous, notwithstanding the innumerable varieties of cultivated hops that have been described.

This monograph comprises 7 chapters and contains a very extensive bibliography. It concludes with generalizations concerning the determination of sex and the phenomena following pollination of the common hop with pollen from very different species. The following information concerning different varieties of cultivated common hop is taken from Chapters I and VII.

The influence of fertilization on the development of the cones is seen in their more rapid growth and greater size. The yield, excluding seeds, is reduced. The bracts of unfertilized cones are more adherent and by remaining intact during manipulation they retain the lupulin to a greater extent, whilst the fertile cones readily drop their bracts with a view to dispersal. It is generally believed that fertilization results in a decrease of lupulin content. The writer, however, is of opinion that the number of glands will remain the same in both types of cone and that only a variation in the relative number of glands owing to the increase in surface area of the bracts would account for the loss of strength. The only disadvantage, but a very important one from a commercial point of view, is the reduced yield of cones after fertilization. The chief disadvantages are: the greater fragility of the cones and loss of lupulin, and perhaps also reduction of the strength of lupulin.

In Belgium and America, and to some extent in England, it is the custom to plant one male hop for every two or three hundred female plants, but in Germany, Bohemia, the East of France and Burgundy all male plants are carefully destroyed and often the local authorities forbid their cultivation. It will only be of advantage to the grower to plant male plants in his fields so long as the increased crops are not compensated for by the lower price for the dried hops.

Male hops should be planted in countries where a cool and damp climate retards the more complete utilization of the plant reserves and where

the growth of the cones is retarded by unfavourable conditions, such as extreme drought or attacks of aphids.

In reviewing the characters of the different varieties, it is only possible to compare specimens of the same variety from different districts. The characters of the cone are as follows: aroma, the character most considered by the brewers, but which has not yet been put on a proper scientific basis: shape of the cones, which varies on the same plant: percentage of seeds, indicating the extent of fertilization: the shape of the bracts, biometric measurements of which might form a suitable basis for classification: the presence of leaves in the cones, an anomaly which appears frequently in certain varieties and which occurs in other varieties in certain favourable seasons. The varieties in which this abnormality appears most frequently yield products of good quality, but are less productive, and when the character is too pronounced there is an excess of material devoid of lupulin which may even impart an inferior taste to the beer.

Other characters which are noted are: the productivity, depending chiefly on the cultivation; the degree of precocity, depending on illumination and general climatic conditions; the colour of the stems and shoots which does not appear to be a fixed specific character.

None of the characters studied appear to be hereditary and they are of no use in defining species or varieties. Each of the cultivated forms appears to correspond to a single individual or to a small number of individuals divided into innumerable parts by means of setts. It is therefore concluded that the species *Humulus Lupulus* is very homogeneous and that the various cultivated forms (of which BRAUNGART has enumerated: from all parts of the world) are only individuals with slight differences.

904 - **Essential Oil of *Ocimum pilosum* Roxb.** — BHADURI KSHETIPRASAD
The Journal of the American Chemical Society, Vol. XXXVI, No. 8, pp. 1772-1774
Washington, D. C., August 1914.

The essential oil is found in every part of the plant including the seeds from which, however, it can only be obtained by distillation when they are fresh. The essential oil obtained by distillation is a current of steam carrying a very mobile liquid, of a light yellow colour; on exposure to the air it volatilizes leaving behind a resinous mass possessing a smell almost identical with that of the essential oil of lemon-grass. Its specific gravity is 0.82 at 25.5° C; its refractive index is 1.4843 or 40° 12' at 24.5° C; laevogyrate with specific rotary power $[\alpha]_D = -4.0$ to -14.1 at 24.5° C.

Its chemical reactions prove that the essential oil contains aldehydes (75 per cent. by volume, of which 41 per cent. is citral and 34 per cent. citronellal), cineol, limonene, and very small quantities of thymol; it does not contain free acids; on being treated with strong mineral acids it evolves the smell of camphor.

905 - **Medicinal Plants in Tunis.** — CUENOD, A., in *Bulletin de la Société d'Histoire de Tunisie*. Year 13, No. 82, pp. 186-189. Tunis, May 15, 1914.

The natural habitat and uses of the following plants are indicated: *Adonis microcarpa*, *Aloe vera*, *Aceras anthropophora*, *Althaea officinalis*, *Anethum graveolens*, *Apium graveolens*, *Artemisia arborescens*, *Borago*

Callitris quadrivalvis, *Colchicum autumnale*, *Lavandula multifida*,
agora autumnalis, *Matricaria aurea*, *Melissa officinalis*, *Mentha*
Papaver somniferum, *Pinus halepensis*, *Rosmarinus officinalis*,
s alba, *Thapsia garganica*, *Trigonella Foenum-graecum*, *Thymus*
us, *Urginea maritima*, *Verbena officinalis*.

A New Cover Crop: *Dolichos Hosei*.—CRAIB, W. G., in *Royal Botanic*
dens, Kew, Bulletin of Miscellaneous Information, No. 2, pp. 76-77. London, 1914.
The writer gives a botanical description of a new species, *Dolichos*
Craib, obtained from the Experimental Plantation, Kuala Lumpur,
S. The value of this plant was first noted by Mr. E. Hose, who
it a great success as a cover crop at Sarawak, Borneo.
The plant is indigenous in Borneo. It thrives on all soils but, prefers
y loam. It forms a thick dense growth about 6 inches deep and when
d 3 feet apart in six months it prevents the washing of the soil.
s difficult to obtain and propagation is readily effected by means of
s.

Studies on the Chemical Composition of Mulberry Trees in Japan.—KAWASE, S.,
d SARTO, R., in *Bulletin de l'Association sericicole du Japon*, Year 1, No. 8, pp. 7-11,
Tokio, April 1, 1914.

The writers give the results of their experiments carried out since 1912
special School of Sericulture at Ueda.

— *Chemical changes during the growth of mulberry leaves.*

s the result of numerous analyses the following conclusions have been

- 1). The percentage of water decreases in proportion to the develop-
of the leaves, whilst the percentage of dry matter increases.
- 2). The percentage of protein in the dry matter and the fresh leaves
ises in proportion to the development of the leaves.
- 3). The percentage of crude fibre in the dry matter and fresh leaves
ses enormously in proportion as the leaves develop.
- 4). The percentage of nitrogen-free extract increases as the leaves
p.
- 5). The percentage of the various nitrogen compounds, albuminoid,
niacal, amino, etc., diminishes as the leaves develop.

1. — *Differences in the chemical composition of leaves on standard*
dwarf trees. — Experiments were conducted on only one variety,
thi, and show that :

- 1). The percentage of crude fat, protein and lime is higher in leaves
andards than in those of dwarfs. The percentage of nitrogen-free
ct is higher in the leaves of standards. The quantity of phosphoric
and ash is almost constant.
- 2). The composition of the leaves on young branches shows no
derable differences in the two types of trees.
- 3). In the case of old branches, the percentage of crude protein, fat
ash is higher in standards than in dwarfs, but the percentage of
gen-free extract and crude fibre is higher in the case of dwarf trees.

III. *Manner of calculating the quantity of manure suitable for the market*. This is based on the results of the preceding analyses and is only strictly applicable to this one variety Komaki. Other investigations with different varieties of mulberries under different conditions are in course of progress in order to determine more general conclusions.

908 - **The Cultivation of European Fruit Trees in Upper Tonking.** — *CHATELAIN* AUGUSTE, in *Bulletin économique de l'Indo-Chine*, Year 17, No. 107, pp. 107-113, Haiphong, March-April 1914.

The region to the north of the delta of the Red river in Tonking has a temperate climate during the greater part of the year, whilst in the uplands it is distinctly cold during the three months November to January. During the months from April to July the temperature rises considerably, especially at altitudes less than 1000 ft. The climate, however, is favourable to the growth of many European plants, including the following fruit trees:

Citrus spp. (oranges, lemons, mandarins, pomeloes). Numerous varieties occur near Tonking. The better varieties are propagated by means of layering. Grafting is never practised by the Annamese, but they understand the methods of growing dwarf trees, and sometimes treat citrus trees in this way.

The *persimmon* appears to have been introduced a considerable time but is not yet very widely distributed. It produces many excellent fruits. The writer observed two varieties: one, small and seedless, the other larger and containing 5 or 6 seeds.

The *pomegranate* was introduced before the French occupation, it is chiefly cultivated as an ornamental plant.

Peaches are widely distributed, especially in the north and east, and are often found half wild. It is chiefly cultivated for its flowers rather than its fruits, which are generally of inferior value. A variety of better quality is found in the mountainous region inhabited by the Thais, at Lao Kay, and in Yunnan on the frontier. The acclimatisation of European varieties has already been successfully attempted at Chi at altitudes between 4000 and 5000 ft.

Plums exist in a wild state near the Chinese frontier. There are several varieties in the Langsom district, one resembling the mirabelle and the other the common plum. Another species of wild plum was met with in the Lang Biang mountains.

The *pear* (*Pyrus sinensis*) is commonly cultivated in the South of China in the district of Langsom (Tonking). Its fruits are handsome in appearance, but of poor quality. There is little prospect of improvement by selection, but something might be done by hybridisation and grafting (e. g. on the wild stock of the Langsom district).

Apples are not grown by the natives in Tonking, but Yunnan already sends them to Hanoi. French varieties have been acclimatised at Chi. A species of wild apple (*Pyrus Doumeri* Bois) has been found in Annam south of Tonking, on the uplands of Lang-Biang: this should be used as a stock for grafting European varieties.

The European *vine* was apparently unknown in Tonking before the French occupation. It does not give good results and is often attacked by mildew, notably oidium. In the *Flore d'Indo-Chine* (Vol. I, Part 8, 1912) AGNEPAIN records 4 species of *Vitis*, two of which, *V. balanseana* Thunb. and *V. pentagona* Diels and Gilg., occur chiefly in Tonking and are not edible grapes.

Figs have been successfully introduced and thrive in Tonking even in the delta region. They multiply readily and yield an abundance of fruit. Several species of *blackberry* are found in the wild state in Tonking and in the south of China. The *raspberry* has been successfully introduced and grows freely.

Red *currants* and *gooseberries* have also been introduced by M. Miéville to Ha-Pa, and produced fruits during 1913. Other fruits introduced are peaches, quinces, nectarines and walnuts.

The *sweet chestnut* probably exists in certain parts of Yunnan, but has not been recorded in Tonking. Several wild species of *Castanopsis* exist and one of them is cultivated for its fruits.

Several varieties of *strawberries* are cultivated on a large scale by the market gardeners near Hanoi. The writer found a wild strawberry at Ha-Pa producing fruits without either flavour or smell and another variety giving fairly tasty white fruits.

It appears that almost all the fruits of the temperate zone can be raised in Tonking, but the productive plants are scarcely introduced or represented by species or varieties different from those cultivated in Europe and generally inferior. The natural advantages of Tonking over those of other neighbouring countries, will enable it to supply European markets to the markets of the Far East. The imported French varieties do not always maintain their qualities; the flavour is always different, sometimes improved, but generally inferior. The improvements require long time and are generally the result of new varieties obtained from seed. Researches on the acclimatisation of suitable European fruits can be carried out only by a properly constituted Agricultural Service.

- **The Propagation of the Date Palm.** — CORNELL, RALPH, in *Pomona College, Journal of Economic Botany*, Vol. III, No. 1, pp. 418-423 + 3 figs. Claremont, Cal., February 1913.

The first date palms were imported by the United States Department of Agriculture twenty-five years ago, but it is only recently that the propagation of this palm in the arid regions of the south-west has assumed commercial importance. At the present time private enterprise has started a nursery of 15 000 palms in the Colorado desert. The cultivation of this palm is limited to this region, Chuckarvalla, Mesa de Palo Verde, Imperial Valley, Yuma, Arizona and the region of Phoenix and the Colorado River Valley.

The shoots or suckers, which may weigh anything from 10 to 50 lbs., are severed from the parent tree by means of heavy chisels specially made for the purpose. After painting the severed butt ends of the shoots, their bases are trimmed and the whole plant is wrapped and sewed in a covering

of palm fibre preparatory to shipment. They are often packed in boxes to facilitate handling on their long journey, during which they must be sufficiently moist to prevent excessive drying, but not so damp as to encourage mould or rot. At the end of their journey the Department of Agriculture requires that they be immersed for two different periods of minutes each in an insecticide of given formula. They must then be planted in nursery form in an isolated place at least 1000 ft. from any other palms and remain thus quarantined for 12 months. Before the planting takes place they are left exposed to the burning heat of the sun for 5 days so as to dry them thoroughly and stop any fungous growth that may have started. The young palms are planted so as to lean slightly toward the prevailing wind, in rows 4 feet apart and 3 feet apart in the rows. They must be kept continually moist and are generally watered on another day for the first six weeks. After this time the frequency of irrigations may be gradually diminished as the young shoots establish themselves in their new home, but the plants should never be allowed to approach a state of dryness. The rooting process is slow and requires 6 or 9 months, sometimes even a year. The percentage of survivals is considerably, but is generally considered satisfactory.

910 - **Date Palms from Irak.** — POPEUVE, PAUL B., in *Pomona College of Agriculture Journal of Economic Botany*, Vol. III, No. 2, pp. 459-477. Claremont, Cal., Mar. 1913.

Irak contains the largest area in the world under date cultivation, and its produce, known as Persian Gulf dates, has monopolised the North American markets for a long time. Nevertheless, when date cultivation began to assume economic importance in California, the material for the new plantations was imported from Algeria, as being more easily accessible. Most of the varieties thus obtained ripen late and the harvest in certain districts is often damaged by rain. Further, they reach the markets when they become dominated by the produce from Irak. It is therefore of great importance to obtain early varieties ripening in August and September. The Department of Agriculture obtained several such varieties from Irak in 1913.

In obtaining these varieties the writer visited Oman, Busreh and Bagdad during the winter of 1912-13. He catalogued and described 112 varieties previously unknown, and about 9000 suckers were shipped for propagation.

A description of the above varieties is given in this article.

911 - **New Fruits on North American Markets.** — *The Journal of Heredity*, Vol. No. 4, pp. 179-184 + 3 figs. Washington, April 1914.

The so-called "Pili nuts" which have been sold on American markets for many years at about 28 cents per lb. are the fruits of *Canarium ovale* and *C. luzonicum* from the Philippines, and to a less extent of *C. comore* from the Dutch East Indies. The first two species exist in a wild state, while the third is cultivated. These trees (which also yield an oleo-resin) were difficult to acclimatise in the United States but would be more suitable to Central and South America.

The Paradise nut is the fruit of various species of *Lecythis*, chief

macajo, cultivated in Brazil, Venezuela, and Guiana. It is sold in United States at about 80 cents per lb.

The Queensland nut is the fruit of *Macadamia ternifolia* and is already experimented with in the south of California and other warmer parts of the United States, where it promises to become of considerable commercial importance.

The Influence of Chemical Manures on the Keeping Qualities of Pears. — BÉRE, GUSTAVE, and BAILLACHE, GABRIEL, in *Journal de la Société Nationale d'Horticulture de France*, 4th Series, Vol. XV, pp. 435-438. Paris, June 1914.

These experiments were conducted with pears of the variety Passe-crassane, from July 5 to August 30, 1913. A row of 12 trees was chosen, which were used as a control and received no application; the other trees received 10 litres of water each week and the remaining received 10 litres of a solution containing 1 gm. of the double rate of potash and ammonia per litre. The fruit was harvested on August 18 and stored until fully matured, when it was analysed. The results were as follows.

In each group the number of fruits per tree was approximately the same (22 to 25); the volumes and weights varied slightly (383, 333 to 36 gms.).

1) The application of manures does not injure the keeping qualities of the variety (Passe-Crassane), since the fruit of the manured trees remained longer than that of the others.

2) Manuring did not affect the chemical composition of the fruits to a considerable extent.

Eremocitrus, New Genus of Citrus Trees from Australia. — SWINGLE, ALGER E., in *Journal of Agricultural Research*, Vol. II, No. 2, pp. 85-100 + 7 plates + 1 table. Washington, May 1914.

The writer gives the botanical description, distribution, morphology, origin and mode of culture (grafting, hybridising and selection), of *Citrus glauca* Swingle (syn: *Triphasia glauca* Lindl.; *Atalantia glauca* (L.) indigenous in the north-east of Australia. It is a spiny shrub, bearing a marked morphological adaptation to desert conditions and characterised by a winter resting-stage and absolute resistance to cold. Its fruits are small, pyriform or roundish, and edible. It grafts easily with all other cultivated citrus trees.

Hybrid Direct-Bearers in the Côtes-du-Rhône District (France) in 1913. — BÉRE, GUSTAVE, AMÉDÉE, and VILLARD, VICTOR, in *Le Progrès Agricole et Viticole*, Nos. 29 and 30, pp. 81-89 and 108-111. Paris, July 19 and 26, 1914.

After a series of observations made in 1913 on Couderc, Seibel and other writers, the writers conclude that among the many varieties obtained by hybridizing there are a certain number which are decidedly valuable. The recent hybrids obtained are much superior to the earlier ones, as the writers have seen in studying the question during the last fifteen years.

Nevertheless the writers do not think it possible at present to select the best hybrid direct-bearers for the great wines, which for the moment

must limit themselves to fine local grafted stocks. On the other hand the hybrids may be advantageously employed in districts which produce only common wines; thanks to them the production of fairly good wine of current consumption becomes steadily more reliable and its cost per hectare cheaper.

Their functions, according to M. Couderc, are: 1) to allow the vine to be grown in localities in which it is not the principal crop; 2) to get a crop in years in which there is much mildew and wine is dear (a kind of insurance); 3) diminish expenses when wines are cheap.

As for the question whether these hybrid direct-bearers are to be grown on their own roots or grafted, the writers believe that there is evidently more safety in grafting them, but that the following direct-bearers may be grown on their own roots on the soils mentioned below:

1. *On very dry soils*: Couderc 123-11, C. 7120, C. 202-75, C. 106, C. 272-60, Seibel 1000, Berthille-Seyve 450.

2. *In medium soils*: Seibel 2007, Castel 1028, Castel 13-706, G. 157, Berthille-Seyve 618.

3. *In good soils* (wheat soils): first the varieties mentioned as suitable for medium soils, and then Seibel 1, S. 128, S. 880, S. 266, S. 2653, S. 4111, Malègue 474-5.

The writers have also studied the dates of shooting of direct-bearers which it is important to know, since spring frosts may injure vines if they open early. It is evident that in districts liable to late frosts, other conditions being equal, late varieties are to be preferred. The susceptibility of a variety to spring frosts is not necessarily due to early shooting, as other factors may modify this sensibility. The time at which the buds open is also affected by various factors, but at the same time should be considered in the choice of a hybrid.

By measuring for each variety at the same period (15th to 22nd April) the same number of shoots and taking the average of such measurements, the writers have established for each hybrid the average length of the shoots, by means of which they could measure the difference in shooting of the varieties under comparison. The results of these measurements are here given:

Length of shoots between 15th and 22nd of April	Group
1 or 2 cm.	late
3 or 4 cm.	medium
5 or 6 cm.	early
7 cm. or more	very early

915 - **The Alpine Limits of Forest Growth.** — D'ALVERNY, A., in *Annales de la Station Agronomique*, Year 3, No. 6, pp. 273-294. Paris, June 1914.

The question as to why the upper limits of forest growth are lower in the centre of mountain groups than on the outside has still received no satisfactory answer.

The two principal explanations attempted are based on temperature and atmospheric precipitations respectively. FLAHAULT inclines to the

and in order to explain the phenomenon, distinguishes between the pine belt with maximum precipitation, and the alpine region proper. great moisture-laden currents of air which strike the mountain ranges of the average slope of the continent inland; the parallel layers, laden with varying amounts of moisture, rise gradually as they approach the high mountain masses. But the maximum of precipitation supposed by this theory is not at all demonstrated; all that the records show is that the first series of mountains act as a screen to the inner masses and prevent a greater amount all there. It is further to be noted that Flahault's botanical characterization of the subalpine zone (presence of *Pinus Cembra*, *P. uncinata*, *Peucephyta* and *Picea excelsa*) is somewhat artificial; in particular, spruce is more nearly with silver fir in not reaching the tree-limit where this forest.

According to Dr. MAREK the alpine limits of forest growth are lower where the annual sum of precipitations is highest. This conclusion, which is paradoxical and in contradiction with the laws of plant biology and current observation, is nevertheless justified if instead of considering moisture it be admitted that other factors contribute to this result. In all the study which has been based on the influence of temperature yielded insufficient results not agreeing with each other, Dr. Marek sees the factor light the one which more especially justifies the paradoxical effect of his law. The factor light must therefore be studied with attention to its effects and must be subjected to accurate measurements (1).

The study of alpine limits would be more complete if the three essential factors of plant life—light, moisture and heat—were all considered together. It could then be seen that trees begin to fail where, owing to the want of light, and notwithstanding the light, growth becomes so slow that it does not counteract the effect of drought. They disappear when the time is too short for the seedlings to produce during the growing season a sufficient quantity of wood to afford protection against the injury caused by cold.

The fruiting of trees diminishes as their situation becomes colder, and the decrease is more marked in clouded and moist positions. It is thus evident that the warm and sunny localities of the central ranges are more congenial than the spurs or outer chains; this is one of the most important reasons of the difference of level of the alpine limits of forest vegetation.

LIVE STOCK AND BREEDING.

Studies on the Toxicity of Cicuta or Water Hemlock.—MARSH, C. DWIGHT, and CLAWSON, A. B. (Bureau of Plant Industry); and MARSH, HADLEIGH (Bureau of Animal Industry); in *Bulletin of the U. S. Department of Agriculture*, No. 69, 27 pp. + 4 plates. Washington, March 1914.

The writers give an introductory account of the historical works dealing with *Cicuta*, a list of its poisonous species, its resemblance to *Conium*, its pathological effects.

(1) See also No. 893, above.

Experiments were conducted in 1910 and 1911 with specimens of *Cicuta occidentalis* occurring in irrigated land in the Ohio Creek Valley, Colorado. Sheep and young cattle were used to determine: 1) whether the plant is poisonous in summer and early autumn; 2) the danger to live stock from eating hay containing *Cicuta*; 3) the symptoms and effect of *Cicuta* poisoning.

The conclusions of the writers are as follows:

1. The symptoms of *Cicuta* poisoning are characterized by restlessness, pain and violent convulsions. The prominent lesions, as found in autopsies, are congestion of the lungs, kidneys, and central nervous system, and inflammation of the alimentary canal.

2. So far as is known all the higher animals are susceptible to *Cicuta* poisoning.

3. A very small quantity of the root may be fatal, but the amount varies with the season and the period of time during which it is eaten. The plant is very poisonous at all stages of its growth.

4. The toxic principle is largely confined to the rootstock; the leaves under ordinary circumstances are not poisonous and neither the tops nor the seeds are dangerous when present in hay.

5. The best remedy is an emetic; hypodermic injections of morphine (from 1 ½ to 3 or even 10 grains in the case of larger animals) are recommended to control the convulsions.

The following species of *Cicuta* are reported as poisonous: *C. maculata*, *C. bulbifera*, *C. vagans*, *C. Bolanderi*, *C. occidentalis*, *C. californica*, *C. Curtisi*, *C. Douglasii*, *C. purpurea*, *C. tenuifolia* and *C. virosa*. There is every reason to believe that all species of *Cicuta* are poisonous, and possibly all equally so.

A full bibliography of *Cicuta*, comprising 49 works, is appended.

917 - **Experimental Investigations into the Cause of Pernicious Anaemia or Type Anaemia in Horses.** — SEYDERHELM, K. R. (Director of the Municipal Slaughterhouse, Strassburg) and SEYDERHELM, R., in: *Berliner Tierärztliche Wochenschrift*, Year XXX, No. 34, pp. 609-612. Berlin, August 20, 1914.

CARRÉ and VALLÉE demonstrated and VON OSTERLAG and MATHIAS confirmed that infective pernicious anaemia in the horse is caused by ultra-visible virus present in the blood, faeces and urine. There remain, however, some doubts as to the manner in which infection took place, as it was observed that in order to procure infection by food soiled with excrements such quantities of these were necessary as to preclude happening in practice. It was further observed that only in very rare instances did healthy horses contract the disease through living alongside of sick ones. On the other hand it has been observed that very often the appearance of the disease followed on the horses being put out to graze. Consequently the hypothesis has been advanced of the existence of an intermediate host of the pathogenic agent. Various writers have suspected intestinal parasites, flies, and ticks of playing the part of intermediate hosts, but none were able to demonstrate the fact.

The writers of this paper proposed to demonstrate experimentally the existence of such an intermediate host. In the autopsies of 85 horses affected by pernicious anaemia they always found larvae of *Gastrophilus* on the mucous membrane of the stomach. An intravenous injection of extract of *Gastrophilus* collected from a horse affected by pernicious anaemia caused a very rapid poisoning—followed by death in 12 minutes—

horse: post-mortem examination showed violent haemorrhagic inflammation. The extract was perfectly harmless for other domestic animals, such as cattle, sheep, rabbits, fowls, guinea-pigs, etc., but not for horses.

The writers showed that the larvae of *Gastrophilus* contain a hitherto unknown animal poison that they call oestrin (östrin), which is characterized by its being poisonous only for horses and asses. Injections in doses or to the mortal dose cause intense motor excitement of all the muscles and fever; the next day a considerable decrease of haemoglobin and erythrocytes is observed. The activity of the extract is not diminished by high temperatures or by the presence of various chemical conditions, hence the conclusion is drawn that the hypothesis of its containing micro-organisms is to be set aside. Another fact points to this view, namely that the disease appears without a preceding period of incubation. Repeated injections of weak doses cause the animal at last to succumb persistently from pernicious anaemia, with all its characters, and to die. The serum of the blood of horses affected by pernicious anaemia following upon injections of extract of *Gastrophilus* larvae, when injected into healthy horses, causes pernicious anaemia, which in its turn can be transmitted to other healthy horses by injection. The writers conclude that the cause of the disease is oestrin secreted by *Gastrophilus* larvae.

Not all horses which are hosts of *Gastrophilus* are affected by pernicious anaemia; but all the extracts of larvae are poisonous, even those from healthy animals. While the extracts of larvae of *Gastrophilus* are relatively of low toxicity, those of *G. haemorrhoidalis* are much more so. In horses affected by pernicious anaemia the writers almost always find *G. haemorrhoidalis*, besides *G. equi* and *G. nasalis*; while in healthy horses the former is usually absent.

The discovery of the writers affords an explanation of the following pathological observations on the natural infection:

1. The disease appears in its acute form mostly from May to October, that is during the period in which Oestrids fly about and deposit eggs on horses.
2. The intensity of the disease varies from one year to another; the number of Oestrids also varies from year to year, probably according to the season.
3. The appearance of the disease is almost always connected with animals being turned out to graze.
4. The disease is hardly ever propagated from diseased horses to healthy horses near them.

5. The disease never appears in horses that are regularly groomed for instance military horses.

The disease may be treated by the expulsion of the *Gastrophilus* larvae only when it is incipient. The writers investigated whether antibodies were formed against oestrin and succeeded in obtaining a highly efficient curative and preventive serum.

Pernicious anaemia of horses may thus be controlled prophylactically by the destruction of Oestrids.

After prolonged dosing with the extract containing oestrin at first only transitory symptoms appear; then the horses begin to be sickly; at a certain stage the disease becomes more serious, even without further injections, and leads inevitably to increasing anaemia, to high fever; then death. In this latter period the blood contains an agent that transmits the disease to healthy horses. The nature of this body cannot be determined with certainty, but judging from its behaviour to physical and chemical agents it possesses properties which differ from those of oestrin. In the first place it is unstable under the action of heat. It might be a substance that could be represented by a chemical formula and be liberated by oestrin from certain parts of the horse's tissue and has the property of acting on the healthy tissues in the same way as oestrin, namely of liberating from the tissues a compound similar to itself. It is the "ultra-visible virus" of the pernicious anaemia of the horse would be a product of anomalous metabolism formed during the course of the disease and which, transmitted to a healthy horse, sets up the pathogenic conditions which cause the same metabolic product to be formed. The process may thus be repeated indefinitely. The research work carried on at the Breslau Chemical and Physiological Institute confirms this hypothesis.

In Japan also investigations have been carried out (by Shimizu and others) into the pernicious anaemia of horses during the last five years. They have proved that the disease is transmissible to pigs, that infection by means of faeces and urine has no practical importance, and that the appearance of the disease is connected with the presence of winged insects. By means of only one inoculation of *Gastrophilus* larvae it was not found possible to cause the disease. The results obtained by the Japanese commission thus agree with those of the writers.

918 - **Microphylaria in Horses affected by Haemorrhagical Boils.** — ROUSS (Veterinary Laboratory, Petrograd) in *Comptes Rendus hebdomadaires des séances de la Société de Biologie*, Vol. LXXVII, No. 26, pp. 390-391. Paris, July 24, 1914.

Horses in Southern Russia are often infested by *Filaria haemorrhagica*. This parasite lives in the subcutaneous connective tissue and causes the formation of haemorrhagic boils on the surface of the skin; when these break a certain amount of bleeding takes place.

On examining drops of the blood the presence of a non-sheathed *microphylaria* was observed; when fixed on the object glass by the alcohol and ether mixture this measured 150 to 224 μ in length. It tapers to a fine point at its posterior extremity which ends in a longish tail.

the blood from the haemorrhagical boils contains also eggs, which are completely developed embryos. The shells of the eggs are very hard and easily coloured.

In the blood taken from the jugular vein of horses affected by these boils the same microphylaria was always found.

The writer examined five horses suffering from these boils and three of them from the same district. In the former he always found microphylariae, while the latter were free from them; from this he concludes that the microphylaria in question is the embryo of *Filaria haemorrhagica*.

Effect of Low Temperatures on the Bacilli of Anthrax. — Contribution to the Study of the Treatment of Meat Superficially Infected by Anthrax Bacilli. By Dr. Kurr (Veterinärabteilung des Kaiserlichen Gesundheitsamts) in *Zeitschrift für Fleisch- und Milchhygiene*, Year XXIV, Part 21, pp. 483-489 + 1 fig. Berlin, August 1, 1914.

The frequent appearance of localized anthrax in pigs has given a new importance to the question of judging the fitness as food of pigs thus affected, as well as of the flesh of animals that have been slaughtered together with such pigs, and which has come into contact with them.

According to the legislation at present in force in Germany pigs affected with localized anthrax are seized and declared unfit for human food, and the meat and offal that comes into direct or indirect contact with animals thus affected, or suspected of being affected, by localized anthrax or with their excreta is for the most part likewise seized and declared unfit for human food or unfit under certain conditions.

In Prussia a Ministerial Order of April 12, 1913, provides that the last-mentioned meat may be exempted from seizure when upon examination it appears that no germs of anthrax have been conveyed to it. Similar legislative provisions have been adopted in most of the other German States.

The fact that the flesh of healthy pigs which becomes infected superficially at the slaughter-house is mostly treated with the same severity as diseased meats, led to investigating whether, besides the treatment with heat, low temperatures would render it harmless.

After referring to the purely scientific researches of Pictet and Young, MacFayden and Belli (who experimented at the temperature of dried air) and to the more practical ones of Klepsoff, who concluded that *Bac. anthracis* may be rapidly killed by very low temperatures and in 21 days at higher temperatures (in 12 days at -24°C , -11.2°F .), the author describes his own experiments, which consisted in keeping cultures of *Bac. anthracis* in pieces of superficially infected meat, blood and organs of infected animals in ventilated cold storage at the average temperature 15°C . ($+5^{\circ}\text{F}$.) with average moisture of 75 to 80 per cent. The details of the experimental results are collected into tables from which the author concludes that anthrax bacilli on meat and in cultures do not lose their vitality or virulence even after two weeks' storage at -15°C . Consequently, even prolonged refrigeration does not render meat superficially infected with anthrax bacilli harmless.

920 - Vaccination against Hog Cholera (1). — CRAIG, R. A., and WHITING, L. in *Purdue University Agricultural Experiment Station, Bulletin* No. 173, Vol. 1, pp. 441-474. Lafayette, Indiana, March 1914.

The purpose of this bulletin is to inform farmers as to the nature of cholera and the methods of controlling this disease. The disease occurs in all sections of the United States, but is especially prevalent in the raising States, where it is considered to be the disease of greatest economic importance. In Indiana alone the annual loss from this cause amounts to about \$3 000 000, excluding the loss resulting from the marketing of young hogs in neighbourhoods where the disease is prevalent. In 19 years (1894 to 1912) 58 800 409 pigs were raised in Indiana, and of these 6 754 died of cholera.

In 1908 Drs. Dorset and Niles, of the Bureau of Animal Industry, demonstrated the method of producing an anticholera serum and its application. A number of State laboratories for the production of anticholera were then established. For the production of a laboratory virus it is best to use young thrifty hogs weighing from 80 to 100 lbs. They should be inoculated with 2 or 3 cc. of hog-cholera blood of sufficient virulence into a susceptible hog in from 8 to 14 days, but preferably in 8 to 10 days. When the hog has developed fatal symptoms of disease, it is killed by cutting the carotid artery near the base of the neck. In order to increase the quantity of virus that may be secured from a hog showing fatal symptoms of hog-cholera, from 10 to 15 cc. per lb. of body-weight of a sterile physiological salt solution are injected into the peritoneal cavity of the hog two to three hours before it is bled. After the hog has been bled the solution is removed by tapping the peritoneal cavity with a side-cattle trocar. The lesions of hog cholera should be marked and accurate character; blood from virus hogs showing fatal symptoms of disease within 6 days following exposure and those showing lesions of tibiaemia in the liver, spleen and skin, should be rejected.

The immune hogs used for the production of serum should weigh from 150 to 175 lbs., since after several re-hyperimmunizations cover a period of from 4 to 6 months the animal may double in weight and become difficult to handle. The injections should be intra-muscular or subcutaneous in the region of the thighs or shoulders. From 10 to 12 cc. of blood per lb. of body-weight are injected on two occasions with an interval of one week between them.

In the intra-peritoneal method, 10 cc. of cholera blood per lb. of body-weight are injected into the peritoneal cavity. This method is not recommended owing to the inferior serum produced.

In the intravenous method, 5 or 6 cc. of virus per lb. of body-weight are injected into the vein of the ear. The injection may be made once twice with an interval of one week.

The virulent salt solution recovered from the abdominal cavity of a cholera hog is about one half as virulent as the cholera blood and should be

(1) See also original article by Dr. Huttyra: "Protective Inoculation against Cholera in Hungary," *B. June 1914*, pp. 707-712. (E.A.)

ed in double the quantity. It is advisable to inject the virus intravascularly in the proportion of 20 cc. per lb. of body-weight.

The hyperimmunised animals are ready for bleeding in from 10 to 15 days after injection of the virus. At each bleeding, which is effected by cutting the tail, 6 cc. of blood per lb. of body-weight may be removed, but animals should not be bled more than three times at weekly intervals after re-hyperimmunising. This process requires only one half the quantity of cholera blood used for the first injection, and the animal should be re-hyperimmunised the same day it is bled. It is ready for bleeding a week or ten days after re-injection with the virus. The bleedings and injections can be practised until the tail becomes so short that it cannot be handled. The hyperimmune animal is then bled to death by ligating the blood vessels near the base of the neck, but it is advisable to re-immunise before making this final bleeding.

The hyperimmune blood is defibrinated and preserved by adding 1 per cent. of its volume of 5 per cent. solution of phenol. Before being used for vaccination purposes it should be carefully tested for potency and the absence of septic organisms.

The vaccination of a hog by the single method consists in giving it 10 cc. of hog-cholera serum, which confers immunity not longer than four weeks. By the double method consists in giving an injection of anti-cholera serum and one of cholera blood. The writers recommend the following doses of anti-serum: for pigs weighing from 50 to 100 lbs., one half cc. per lb. of body-weight; for pigs weighing from 100 to 300 lbs., from 1 to 2 cc. In using cholera blood: pigs weighing less than 100 lbs. receive 10 cc. and pigs weighing more than 100 lbs. 1 ½ to 2 cc.

During the period July 1908 to March 1914 the State of Indiana provided 9 881 998 cc. of serum; this was used for the vaccination of 247 049 pigs; the percentage loss in the healthy herds was 2.39, whilst that of the diseased herds was 9.02.

An extract of the law relating to the prevention, spread and control of the disease in Indiana is appended.

The Influence of Food Poor in Lime on the Composition of Growing Bones.—

VESER, STEPHAN, in *Biochemische Zeitschrift*, Vol. 66, Part 1-2-3, pp. 95-114. Berlin, July 29, 1914.

The writer kept a group of three young pigs, from the 15th of January to the 1st of October, on food rich in lime and another perfectly similar group on rations poor in this substance. After the animals were slaughtered, the bones were analysed; it was found that a food poor in lime diminished the development of the animals to such an extent that from the beginning their increase in weight was about 20 per cent. less than that of pigs fed on food rich in lime. The prolonged want of lime always retarded the appetite to diminish and consequently the live-weight also.

The pigs that had not been fed enough lime had in general deformed ribs, the bones, thinner and easier to cut than those of the other lot. The differences in growth and weight of the skeletons, however, could not be explained. Out of the total weight of the body of the pigs poor in lime,

the weight of the fresh bones and of the dry matter represented a greater percentage (14.29 and 5.05 per cent.) than in the other lot (8.74 and 3 per cent. respectively).

The bones of the lot lacking lime contained considerably more water and much less ash than those of the others, but their fat content was nearly the same.

The differences in the ash content were least in the bones of the skull and greatest in the ribs. In the pigs deficient in lime, out of the total content of the skeleton a greater proportion was found in the skull than was the case with the other lot.

The bone-ash of the former is considerably poorer in CaO than the latter; a difference in the same direction, though smaller, was observed also in the P₂O₅ content.

The essential difference between the composition of the bone-ash of animals deficient in lime and that of animals rich in lime is that the former includes considerable quantities of alkalis (Na₂O, K₂O).

922 - Investigations into Factors affecting the Handling of Wheat Hay, in *feeding a Study of its Digestibility*. — PERKINS, A. J.; PHILLIPS, J. H.; STONE, W. J., and MAY, N. S., in *The Journal of the Department of Agriculture of Australia*, Vol. XVII, No. 7, pp. 720-755, Adelaide, 1914.

The experiments of 1912 and 1913 confirm the conclusions of 1911 and include feeding trials.

King's White wheat was grown on half-acre plots which were cut at intervals of one week from the 10th of October to the 20th of November. The results are given in Tables I-V.

TABLE I.

Details of seven cuts of hay taken between full bloom and ripeness.

Date of Cutting	Yield per acre		Moisture	Loss of weight on drying	Percent of water in hay as 10 % moist
	tons.	cwt. lbs.	per cent.	per cent.	
1. — Oct. 10	1	17 86	11.31	71.33	12.26
2. — " 16	2	2 20	10.27	61.32	15.17
3. — " 23	2	9 77	10.71	53.11	19.08
4. — " 30	2	13 55	9.95	47.37	24.68
5. — Nov. 6	2	9 7	8.27	49.15	31.56
6. — " 13	2	10 93	7.53	33.63	37.00
7. — " 20	2	8 67	7.20	24.00	39.41

(1) See No. 1522, B. Nov. 1912.

TABLE II. — *Composition of hay cut in various stages of maturity, in terms of oven-dried material.*

	1st Cut (Oct. 10)		4th Cut (Oct. 30)		7th Cut (Nov. 20)	
	Ears.	Culms and Hay.	Ears.	Culms and Hay.	Ears.	Culms and Hay.
Mineral matter	7.25	7.88	6.07	7.08	4.83	6.43
Organic matter	92.75	92.12	93.93	92.92	95.17	93.57
Proteins	11.86	4.56	11.16	4.38	9.71	2.28
Fat	1.16	0.64	1.10	0.94	1.10	1.10
Carbohydrates	49.66	54.38	63.06	53.90	71.34	48.12
Fibre	30.07	32.54	18.71	33.70	13.02	42.07

TABLE III. — *Distribution of constituent parts of wheat hay cut in various stages of maturity (lbs. per acre).*

No. of Cut.	Mineral Matter	Organic Matter	Proteins	Fat	Carbohydrates	Fibre
1st	292.7	3 458.7	204.6	26.4	1 209.3	2 018.2
4th	368.5	5 026.1	326.5	51.5	1 618.4	3 029.6
7th	292.9	4 757.8	263.0	55.5	1 546.6	2 892.6

TABLE IV. — *Chemical composition of wheat hay oven dried immediately after cutting and of wheat hay analysed after ordinary field drying process.*

	Oven-dried per cent.	Field-dried per cent.
Mineral matter	6.63	6.91
Organic matter	93.37	93.03
Proteins	6.13	6.13
Fat	0.80	0.76
Fibre	28.02	28.36
Carbohydrates	58.42	57.84
Moisture	58.94	11.99

TABLE V. — *Mean coefficients of digestibility of the constituents of wheat hay cut in various stages of maturity.*

Constituents	Cut Oct. 10	Cut Oct. 30	Cut Nov. 20
Mineral matter	54.32	51.82	48.83
Organic substances	24.22	29.38	12.72
Mineral matter	56.64	53.48	51.15
Proteins	60.10	53.87	60.62
Fat	46.99	32.42	30.12
Carbohydrates and fat	61.56	62.91	59.94
Starchoid ratio	1 : 19	1 : 15.25	1 : 12.24

Conclusions.

1. The yield of dry fodder from wheat varies according to the period of cutting; the average relative yield per cutting during the flowering period is as follows:

Days after flowering	Percentage dry fodder
6	20.31
13	24.02
21	36.04
28	32.62
35	21.90
42 (grain ripe)	14.24

The maximum yield is obtained by cutting 3 weeks after the period of full flower, when the grains leave the milky stage. This is the case with wheat grown in a climate requiring six weeks between flowering and maturity.

2. There is a greater increase in weight in the ears than in the stems and leaves during the three weeks following the flowering period. At the end of three weeks the weight of the ear continues to increase, whilst that of the stem and leaves begins to decrease, and two weeks before maturity the ears weigh less than at the flowering period. The following figures show the average (1911 and 1912) percentage increase in weight after the flowering period.

Days after flowering	Ear	Stem and leaves
0	100.00	100.00
6	137.77	118.28
13	153.10	119.08
21	246.75	120.48
28	321.05	106.70
35	337.00	92.54
42 (grain ripe)	340.40	83.33

Cutting the crop after the grains have passed the milky stage results in a loss of nutritive substances and a badly balanced hay, and unless harvested at least two weeks before maturation the hay deteriorates considerably.

3. The relative differences in chemical composition of the crop at different stages are as follows: a) a progressive diminution in the percentage of ash and a corresponding increase in organic matter during maturation; b) the percentages of albuminoid substances tend to increase during the first three weeks, then diminish until complete maturation of the grains; c) the percentage of fatty matter appears to remain constant during the flowering period; d) the percentage of carbohydrate in the ear increases regularly during the six weeks (being 50 per cent. of the dry matter at flowering and 72 per cent. on maturation), and it is balanced by a corresponding decrease in the stems and leaves; e) conversely, while the percentage of cellulose gradually increases in the stems and leaves (from 32 per cent. at flowering

- 42 per cent. on maturation), it decreases in the ear (from 30 per cent. at flowering to 13 per cent. on maturation).
4. There is a considerable loss of dry matter in the grains during one or three last weeks, reaching 22.9 per cent. of the highest yield in 1912. This loss is undoubtedly due chiefly to the breaking of the leaves and partly to the separation of grains or accidents, such as a lowering or suspension of the assimilatory function or washing out of the porous tissues by rain. The annual loss of dry matter (20.51 per cent. in 1912-13) was considerably greater than that of the organic matter (5.34 per cent.); from this it is concluded that the loss of mineral substance towards the root takes place as maturation proceeds.
5. The loss of weight on drying decreases as the time of cutting approaches the ripening stage. In the case of the 1st, 4th, and 7th cuts respectively 71.45, 47.44 and 24.04 per cent. of the green weight was lost during the flowering period, and less than $\frac{1}{4}$ of the green weight after the flowering period.
6. The percentage moisture in the hay varies slightly according to the conditions of drying. Generally hay cut early retains more moisture than hay cut late. South Australian wheat hay has an average of 10 per cent. of moisture.
7. The loss of weight of hay allowed to dry naturally in the fields is exclusively due to the evaporation of moisture. The writers conclude that at least 1.5 per cent. of this loss is due to the decomposition of organic matter, such as carbohydrates. Comparing the composition of the plant with that of the hay dried *in situ*, and assuming both to have contained the same proportions of water, the writers found a loss of 4.05 per cent. of dry weight, or 1.66 per cent. of the green weight, which they estimate as follows: protein matter 0.10, fatty matter 0.03, cellulose and carbohydrates 1.20.
- Digestibility experiments on horses showed that wheat hay cut at the flowering period is more digestible than hay cut later and that the digestibility diminishes in proportion to the lateness of the cutting. There is a difference of 12 per cent. in the digestibility of hay cut at the flowering period and that cut when the grain is ripe. The decrease in digestibility is noticeable in the case of the albuminoid and cellulose constituents as well as for the mineral matter and carbohydrates. The ratio of the digestible nitrogenous matter to the digestible non-nitrogenous matter is higher in the case of hay cut early, owing to the greater digestibility of albuminoids in early hay and the predominance of carbohydrates in hay cut late.
- Thus, there is everything to lose and nothing to gain in postponing the cutting of the crop until the grain begins to harden. The practice of cutting the value of hay from its colour is fully justified, a distinct green being the best colour.

- 923 - **Bacteriological Research on Ensilaged Forage.** — GORINI, COSTANTINO, in *lettino dell'Associazione Italiana dell'industria dello zucchero e dell'alcool*, Vol. No. 4, pp. 83-90. Bologna, July 1914.

The bacteriological researches carried out by the writer (2) justify the suggestion, which he made in 1907, that selected lactic ferments should be added to ensilaged forage. This is all the more so as the loss from butyric silos, though it may be considered as successful, presents some disadvantages. It must especially be noted that intestinal troubles are observed in the cattle fed on such ensilage, and that this forage should be avoided in dairies, not only for the odours and flavours which it imparts to milk and butter, and especially to the bacterial flora, of a fermenting nature, which may cause cheese made with such milk to be

- 924 - **Live Stock Feeding Experiments in Ireland, 1912-13.** — Department of Agriculture and Technical Instruction for Ireland, *Journal*, Vol. XIV, No. 3, pp. 456-470. Dublin, April 1914.

These experiments are in continuation of those begun in 1912. (*Journal*, Vol. XIII, No. 3).

1. — Pig Feeding Experiments.

Series I. *Comparison of potatoes and meal.*

The object of these experiments was to determine if pigs can be reared successfully without potatoes. During the past two seasons an experiment was conducted with 148 pigs at 20 centres distributed through 13 counties. The average age of the pigs was 13 ½ weeks and the duration of the experiment 108 days. At each centre the pigs were divided into two lots. Lot 1 received a certain quantity of potatoes in addition to other foods (maize, pollard and separated milk), whilst lot 2 was given an extra pound of the meal mixture in place of every 4 lbs. of potatoes fed to lot 1.

The results obtained are set forth in Table I.

Whilst these figures show that the average daily gain in live-weight was practically the same for each lot of pigs, nevertheless, in respect of rate of increase in live-weight, cost of producing a given increase in weight and quality of pork, the pigs fed on meal alone were slightly, but fairly uniformly, superior to the pigs which received potatoes. The question as to whether potatoes should be sold or fed to pigs depends largely on the current prices of potatoes and meal respectively. It is very doubtful whether it is economical to feed pigs on saleable potatoes if they can be sold for one-fourth the value of meal, in addition to the cost of making

Series II. *Barley meal compared with maize meal.*

This experiment was conducted with 106 pigs at 15 centres. The average age of the pigs at the commencement was 13 weeks and the duration of the experiment 100 days.

The results obtained are set forth in Table II.

(1) See No. 547, *B.* June 1914.

TABLE I.

Food.	Price per cwt.	Quantities.	
		Lot 1.	Lot 2.
	s. d.	cwt. lbs.	cwt. lbs.
meal	7 6	141 21	220 92
al	7 0	89 101	146 26
s	12 0	0 84	0 84
s	2 0	524 28	— —
ed milk	1d. per gallon.	3247 gallons	3247 gallons
ed cake	10 6	2 28	2 28
refuse	— —	— —	— —
Cost of food	— —	£155 10s.	£149 13s.
age increase in live-weight	— —	1 cwt. 50 lbs.	1 cwt. 54 lbs.
of producing 1 cwt. live-weight increase	— —	£1 9s 1d.	£1 7 3d.

TABLE II.

Food.	Price per cwt.	Quantities.	
		Lot 1.	Lot 2.
	s. d.	cwt. lbs.	cwt. lbs.
y meal	7 0	134 99	— —
meal	7 6	— —	135 23
ses	2 0	339 9	335 65
es	8s per ton	35 0	35 0
rated milk	1d per gallon	1062 gallons	1051 gallons
ed cake	10 6	2 0	2 0
e refuse	— —	— —	— —
of food	— —	£87 15s 10d	£90 17s 8d
age live-weight increase	— —	1 cwt. 34 lbs.	1 cwt. 37 lbs.
of producing 1 cwt. live-weight increase	— —	£1 5s 6d	£1 5s 10d

In two experiments where swedes were fed instead of potatoes, the swedes made very slow progress, the average daily increase scarcely exceeding one pound per head. The results of these experiments appear to indicate that maize is worth approximately 10s per ton more than barley meal for pig feeding. As regards quality of pork, barley meal seems to be slightly superior to maize meal. It should be noted that the estimated

cost of production is based on the cost of the food only. In practice many other items, such as attendance, fuel, risk and interest on capital have to be considered.

2. — Calf Feeding Experiment.

This experiment was designed to compare the value of oat meal and wheat meal respectively, when used in conjunction with maize meal and ground linseed for calf feeding. It has been carried out during the past two seasons at 31 centres. 244 calves were selected and divided into two lots; their average age at the commencement was seven weeks and the experiment lasted 117 days.

The results are given in Table III.

TABLE III.

Food.	Price per cwt.	Quantities.							
		Lot 1.		Lot 2.					
		s.	d.	cwt.	lbs.	cwt.	lbs.		
Oat meal mixture	14 0			105	92	—	—		
Wheat meal mixture	13 0			—	—	105	85		
Linseed cake	10 6			31	72	31	72		
Whole milk	5 d. per gallon			91	gallons	91	gallons		
Separated milk	1 d. per gallon			18	765	gallons	18	765	gallons
Total cost of food	—			£170	15s 3d	£16	3s 3d		
Live-weight increase (mean)	—			1 cwt.	78 lbs.	1 cwt.	77 lbs.		
Cost of production of 1 cwt. of increase	—			16s	6d	16s	1d		

In the above estimates no account is taken of the value of the hay consumed or the grazing, but these items are the same for both lots. On the whole, there was no appreciable difference in the health or appearance of the two lots of calves. The difference in the cost of production is so small that it would appear that the two meal mixtures are of practically equal value at the prices mentioned.

III. — Cattle Feeding Experiments.

Experiment A. — Cattle on grass.

This experiment has been conducted at 14 centres with two lots of 62 cattle each. Lot 1 received a mixture of home-grown concentrate foods, whilst lot 2 received a corresponding quantity of imported food.

The mixture were made up as follows:

Home-grown.

- 1 part wheat meal.
- 1 ½ parts barley meal.
- 2 parts ground oats.

Imported.

- 1 part maize meal.
- 2 parts undecorticated cotton cake.

At the beginning of the experiment 3 lbs. of the above mixtures were per head daily; this amount was afterwards increased to 4 and to 5 lbs. towards the end of the fattening period. The average duration of the experiment was 79 days. The results are set forth in Table IV.

TABLE IV.

Food.	Price per cwt.	Quantities.							
		Lot 1.		Lot 2.					
		s.	d.	cwt.	lbs.				
grown:									
best meal.	8 0	43	60	—	—				
fine meal	7 0	65	34	—	—				
round oats	6 8	87	8	—	—				
imported:									
fine meal.	7 6	—	—	65	34				
decorticated cotton cake.	6 6	—	—	130	68				
		£	s	d	£	s	d		
of food:		—	—	69	5	10	66	18	9
concentrated		—	—	69	19		69	19	5
razing.		—	—	139	8	3	136	18	2
total.		—	—				13	2	3
manurial value		—	—	132	1	8	123	15	11
total cost of food less manurial value		—	—	117 cwt.	102 lbs.	117 cwt.	102 lbs.		
total increase of live-weight		—	—	£1	2s	5d	£1	1s	5d
cost of producing one cwt. live-weight increase		—	—						

The average results of these experiments show that the increase in live-weight made by the two lots of cattle was identical, but the cost of production was somewhat in favour of the imported foods.

Experiment B. — Stall-fed cattle.

This experiment was carried out at 21 centres with 176 cattle in 2 lots. Lot 1 received the same home-grown foods as in the preceding experiment, whilst lot 2 received a mixture of 1 part decorticated cotton cake and 2 parts fine meal. At 15 centres, part of the decorticated cotton cake was replaced by linseed cake during the finishing period.

At the beginning of the experiment 3 lbs. of concentrated food were given daily, and this quantity was gradually increased, until in some cases as much as 10 lbs. were supplied. The average duration of the experiment was 82 days.

The results are set forth in Table V.

TABLE V.

Food.	Price per cwt.	Quantity		
		Lot 1.		Lot
	s. d.	cwt.	lbs.	cwt.
<i>Home grown:</i>				
Wheat meal	8 0	90	54	—
Barley meal	7 0	135	81	—
Ground oats	6 8	180	108	—
<i>Imported:</i>				
Maize meal	7 6	—	—	271
Decorticated cotton cake	9 6	—	—	144
Linseed cake	10 6	—	—	21
<i>Bulky food:</i>				
	per ton.	tons.	cwt.	qrs.
Roots	8 0	256	1	3
Hay	40 0	26	5	2
Straw	30 0	14	8	3
<i>Cost of food.</i>				
		£	s	d
Concentrated	— —	144	0	5
Bulky foods	— —	176	12	9
Total	— —	320	13	2
Value of manure produced	— —	14	18	1
Cost of food less manurial value	— —	305	15	1
Total live-weight increase	— —	112 cwt.	40 lbs	118 cwt
Cost of producing 1 cwt. of live-weight increase	— —	£ 2	14s	5d

The average live-weight increase was one-tenth pound per head in favour of the imported foods, and the cost of production per cwt weight increase was 11d in favour of the imported foods.

Considered as a whole these experiments show that for all practical purposes no superiority can be claimed for either class of concentrated foods at the prices quoted.

925 - Preliminary Notes on the Heredity of Certain Characters in a Cross between Silky and Yokohama Fowls. — BONHOTE, J. L., in *The Cairo Scientific Journal* Vol. VIII, No. 91, pp. 83-89. Alexandria, April 1914.

The writer received from M. Debruil, of Melun, France, a pair of fowls which were the offspring of a male Silky and a female Duck Yokohama; the cross had been made in the hope of obtaining a combination of the texture of feathers of the Silky with the length of feathers of the Yokohama, with a view to using the feathers as substitute

keys", etc., the writer bred from these two birds to study the inheritance of the characters involved.

The characters of the parent birds were: *Silky* (male), dark-fleshed, with short silky feathers, rose comb, five-toed, with feathered feet and a small crest; *Yokohama* (female), white-fleshed, Duckwing, long normal feathers, a single comb, four-toed, clean legs and no crest.

The two birds of the F_1 generation were uniform (sex excepted) and showed a practically complete dominance in almost all cases, *e. i.* dark red, coloured plumage ("black-red"), normal feathering, long-tailed (especially in the male), clean legs, crested. The carriage of the tail-feathers was intermediate between that of the parents. The male had five toes the female only four.

The F_2 generation is considered in two groups. The first group, consisting of 96 individuals, deals only with those characters such as colour of flesh and feathers, simple or rose comb, 4 or 5 toes, which are visible at birth and on which statistics concerning all the chickens hatched are available. Of these 66 pigmented flesh and 30 non-pigmented; 71 were coloured and 25 white, (expectation 72:24) but very few were pure white; majority showed some red pigmented feathers on the saddle, the red portions being sharply divided from the rest. It is evident that the chickens are not pure recessives but contain a certain amount of dominant. 30 chickens hatched from eggs of these individuals showed the characters, giving no really coloured ones. The writer suggests this form of coloration is the initial stage of the "pile" type of coloration found in other breeds of fowls.

No "Duckwing" character appeared in the F_2 generation, all the individuals being of the "black-red" type, but of two kinds, one having red breasts with a few red feathers, the other red breasts with a few white feathers.

With regard to character of comb, 83 had rose combs and 13 single combs. The ratio of five-toed individuals to four-toed was 64:32. The inheritance of both these characters was complicated by intermediate forms. The characters of the second group, *viz.* silky or normal feathering, long or short feathers, clean or feather legged, crested or not, were studied in individuals reared to maturity. Of these 18 were normal and 6 silky. Head feathers and tail feathers are only silky at their ends and practically normal at their bases. The length of feathering is difficult to determine apparently not inherited in a strictly Mendelian manner. No two birds alike in this respect, but the writer by adopting a provisional standard divided the birds when six months old into two groups of 19 long and 5 short, thus showing that the long-feathered type is dominant. The character which determines the length of the feather is the growing rate of the feather follicle and this is undoubtedly influenced by the food, environment and individual vigour of each bird, so that when this character is blended with the normal it is only to be expected that the actual length of feather in the progeny would be largely dependent on the indi-

vidual when the environment remains constant. Sixteen individuals, clean-legged and 8 feathered, but, of the 8 feathered ones, 4 were only feathered and therefore almost certainly heterozygous, thus giving 20 dominants and 4 recessives. The crest was developed in these crosses, but present in 21 individuals and absent in only 3.

Thus, the Mendelian expectations with regard to each character have been largely realised. The writer remarks that recessives are more frequent among females, owing to the absorption of more of their initial vigour on their s.x, and that recessive characters more usually associated with the female can be produced in males by an artificial reduction of vigour. Also if colour may be to a certain extent an indication of vigour we shall expect to find a higher percentage of recessive characters among white birds than among the coloured ones.

Of these 24 birds, 10 were males and 14 females, 19 coloured and 5 white.

The 10 males showed 13 recessive, 6 heterozygous and 61 dominant characters; the 14 females showed 24 recessive, 14 heterozygous and 14 dominant characters. The 19 coloured individuals showed (excluding white or coloured as characters) 22 recessive, 14 heterozygous and 14 dominant characters; the 5 white individuals showed 10 recessive, 14 heterozygous and 19 dominant.

These results show that on the average the females have 0.41 recessive characters than the males, and the whites 0.74 more recessive characters than the coloured.

The writer therefore concludes that the Mendelian proportions are to a certain extent affected by vigour and that it is practically possible to increase the number of individuals possessing a certain character by attention to such details as the food, temperature, age of the breedings and time of year at which breeding takes place.

926 - Studies on Inheritance in Pigeons: Hereditary Relations of the Pigeon Colours. — COLE, L. J., in *Agricultural Experiment Station of the Rhode Island College, Bulletin No. 158*, pp. 313-380 + 4 plates. Kingston, R. I., May 1914.

These investigations were begun at the Rhode Island Agricultural Experiment Station in 1907, to determine the mode of inheritance of colour in birds. Previous work on inheritance in birds (fowls and canaries) has not given data as definite as in the case of mammals. In the case of fowls this was undoubtedly due to the complications introduced by colour patterns originating in different colour schemes for each breed. Pigeons have been chosen because it is possible to select strains of uniform colour and free from pattern complications.

In most of the studies with fowls, crosses were made with very different breeds showing very marked differences in a large number of characters, thus resulting in confusion. The writer has considered it more advisable to confine his observations to certain well-defined differences in the same breed (Tumblers). It also appeared less probable that similar characters would behave differently in the same breed.

the primary colours of pigeons are: red, yellow, black, brown, blue, and white. These experiments have shown that these colours are determined by only two types of pigment, black and red. Red is the fundamental colour of pigeons and probably also of fowls and the majority of mammals. The red factor is always present, but it only determines the colour of the bird in the absence of an inhibiting factor or of a dominant factor such as the factor for black. For the full manifestation of these two factors an intensifying factor is necessary. When this factor (I) is absent, the colour is of a lighter shade and red becomes yellow, whilst black becomes grey. The I factor is definitely sex-linked in its inheritance. "Duns" are easily obtained by crossing birds having the B factor with birds lacking the I factor, e.g. black \times yellow.

Thus, mating a yellow cock (bbii) with a black hen (BBII) heterozygous for I, will produce black cocks and dun hens, since the factor I is dominant to the males. In the reciprocal cross all the F_1 generation will be duns and duns will appear in the F_2 generation.

The blue colour of the wild pigeon (*Columba livia*) is due to the effect of black pigment aggregated into clumps. In the black birds the pigment is uniformly distributed. This is accounted for by supposing the presence of a spreading factor (S), the absence of which results in the black colour. Silver colour is regarded as a diluted blue and is therefore due to the factors I and s. White is due to the absence of pigment and the reflection of light. Pure whites are fairly common but rarely true, and the mode of inheritance is very complex. Colour is dominant over white but not entirely. Pure white should undoubtedly be considered as the extreme reduction of mottling. As a provisional hypothesis white may be considered as due to the presence of an indefinite number of factors preventing the formation of pigment. Thus the quantity of white depends on the number of these factors present.

The marking of the plumage of pigeons may be of the following types: 1) splashes or intermingling of white and coloured feathers without definite patterns; 2) special patterns, i.e. a combination of white and coloured areas forming a more or less definite marking; 3) check, light and dark markings on the wings; 4) grizzling, i.e. bars partially white and partially coloured; 5) mealiness, due to the whole or partial replacement of white by red; 6) frosting, due to the presence of white distal tips on the contour feathers.

It is possible that a particular portion of the plumage may be determined by homozygous factors, such as W_1 , W_2 , etc.

The frequent reappearance of the blue colour of the wild rock pigeon (*Columba livia*) is due to the recurrence of the particular combination of factors present in this type.

In the experiments on the dominance of black over red, the F_2 ratio was nearer 2:1 than 3:1. This was not due to the absence of homozygous dominants, but rather to the tendency toward the production of different results in different families or strains. All the results show a slight excess

of red offspring above the normal expectation of a pure dominant ; recessive.

In the experiment on the inheritance of the I factor the crossing heterozygous individuals always gave the 3: 1 ratio; the cross between the heterozygous F_1 and the recessive parent always gave the ratio thus showing that the factor for intensification of colour segregates ; strictly Mendelian fashion.

Various matings between birds of different colours gave results according to expectation. In general the offspring tend to be grouped around parental mean with respect to amount of colour in the plumage. The evidence points to the conclusion that a number of factors are concerned in production of white and splashed birds.

927 - **Animal Husbandry in Sardinia in Connection with Environment.** — by MARCO, (Director of the Royal Horse-Breeding Station of Ploaghe) in *Il Soc. Zootetra*, Series V, Year III, No. 7, pp. 313-326. Bologna, July 31, 1914.

In Sardinia, where agriculture is still mostly extensive, live stock is most important source of income. The animals are generally bred within the open.

Horses. — The Sardinian horse, descended from African and Arabian breeds, has had a period of celebrity, which came to an end chiefly through too close in-breeding. According to the writer, when the State founded stallion depots and stations, a great mistake was made in not taking native horse into account, and of using among others English stallions; these increased the stature of the animals but at the expense of muscle and the harmony of their shape. The cross of the Sardinian (Oriental) with the English horse has led to a great variation of forms, so that no uniform local breed exists. The horses of Gallura and of Anglona have most English blood, and form a distinct type. According to the writer the stallions to be adopted for the improvement of Sardinian horses should be of pure Oriental breeds, which, like the native Oriental crosses, have the advantage also of being better stock getters than the English stallions.

Cattle. — Cattle breeding has made much progress of late years in Sardinia. There are three breeds of cattle in the island: the plain breed imported from Sicily, the Schwytz (brown variety) on the hills and in the best pasture lands; the Sardinian or mountain breed, which has remained in its primitive state, not having been subjected to any crossing. It inhabits the mountains especially of Gallura, of the Fonni plateau and of the Orgosolo and Aritzo. The plain breed lives in the so-called *planargia*: the Campidano towards Oristano; it is especially suitable as a draught animal; the meat is good, but not much sought after on the markets. The mountain breed is a good draught animal for rough and stony localities; it does not yield much milk; its flesh is excellent, though but little streaked with fat. The Schwytz breed has given origin to the Swiss-Sardinian breed, which is raised all over the island and gives excellent products, as for instance at Oristano, Macomer, Ozieri, Nulvi, Ploaghe, Mores, Bonorva, etc. The Schwytz breed has proved the best for the improvement of Sardinian cattle, though the excess of new blood, if not accompanied by improved

in the pastures and in the treatment, sometimes causes stunted development and a decrease in the yield of meat and milk. For this reason the deprecates the use of a pure-bred bull beyond the third or fourth generation, after which cross-bred bulls should be used unless special reasons require recourse to a pure bull again.

Sheep. — Grazing is the most important industry in Sardinia. There are two breeds in the island, one in the plains and the other in the mountains.

On the plateau of Bitti and in the districts of Fonni, Orgosolo, etc., is a small hardy breed with roughish and short wool, which does not produce much milk; it passes the winter in the plains or on the hills. In the mountains and in the richest pastures the sheep are a cross derived from the mountain breed and the Campidano breed, which is only an importation from Algeria, Tunis and the plains of Apulia. It is bred pure in the fine valleys of the Campidano of Oristano. The introduction of a certain amount of blood of this breed into the mountain breed produces sheep of a suitable stature, yielding good wool and flesh and a fair quantity of milk (an average of 1 ½ to 2 pints per day in spring and in favourable winters). Further crossing gives a much larger sheep which yields more meat but at the expense of the yield in milk and wool. It would therefore be advantageous to practice alternate crossing, that is using Campidano or mountain rams for two or three generations and then cross-bred rams.

Pigs. — Pig breeding is also flourishing in Sardinia; it is chiefly a family industry of the poor, but there are also extensive herds on the mountains and wooded parts of the island. The principal pig-breeding centres are in Bolotana, Silanus, Monti, Buddusò and the Gallura region, which is mountainous and rich in woods. Pig breeding is practised more or less all over the island. In the chief centres the local breed has been crossed with the Caserta, the Verona and Yorkshire crossbreds. Such pigs are readily met with in the country about Ozieri, Mores, Pattada, Nulvi, Borge. The Sardinian breed still bears a considerable resemblance to the wild boar; crossing it with other breeds has much improved the breed, increased its weight and caused measles to disappear from many of the crosses. The crosses at the age of two years weigh 440 to 550 lbs. dead weight; the pork and hams are excellent. The pigs are fed on butter-milk and bran up to the age of five or six months, after which they are put up in sties to be fattened. Sometimes the want of exercise and the stress causes a form of rheumatic arthritis, on the appearance of which the animals have to be slaughtered immediately.

Report of the Dickinson County Cow-Testing Association: Results of the First Year. — REED, O. E., in *Kansas State Agricultural College Experiment Station, Circular No. 35*, 8 pp. Topeka, Kansas, 1914.

The records of the Association contain a complete account of the performances of 134 cows during a period of 12 months. The average annual production of these cows was 6019 lbs. of milk and 246 lbs. of butter-fat, while the average Kansas cow produces only 100 lbs. of butter-fat. The cost of feed was \$ 35.59 per cow per annum and the value of the milk and butter-fat produced was \$ 90.48, leaving a net profit per cow of \$ 54.89.

assuming that the calf and manure produced are liberal compensation for labour and risk.

The best cow (a Holstein) produced 546 lbs. of butter-fat in 11 months. The poorest cow in the same herd produced only 175 lbs. of fat, whilst the poorest cow in the Association produced only 59 lbs. at a cost of \$ 33. The ten best cows made an average profit of \$ 96.43, which is more than three times the average profit made by the ten poorest. With one exception, the ten best cows were dairy-bred animals, while there was only one of the poorest that showed any trace of dairy blood in its pedigree. The ten poorest cows made an average of only 119 lbs. of butter-fat for the year, at a profit of \$ 15.23. The profitableness of these poor cows appears still less when one considers that most of them calved in the spring and produced only while on grass, thus greatly cheapening their rations. Further, the value of the calves and manure from this batch of cows would not compensate for the labour expended, while in the case of the ten best it would be an additional source of profit.

Some of the cows with low records of milk production were handicapped by being allowed to remain dry several months of the year and are capable of much better performances under better conditions. It is generally true that many good milch cows are allowed to go dry longer than is necessary and it should be borne in mind that a cow returns the greatest profit when kept in milk throughout the greater part of the year.

299 - The Breeding of Karakul Sheep in the United States (1). - Young, C. *The Journal of Heredity*, Vol. V, No. 4, pp. 170-178 + 3 figs. Washington, April 1914.

The first importation of Karakul sheep into the United States was in 1909, when the writer brought 10 ewes and 5 rams from Bokhara to Wichita Falls, Texas. In 1913 a second batch of 17 was received from Central Asia. Of the first importation only two gave birth to lambs, and these had thick curly fleeces. The writer found that among the imported ewes and rams, some had thick coarse fibres in their fleeces whilst others had a layer of short fine, reddish wool under the fleece, which was wavy and resembled Merino wool under the microscope. The ewes imported from Bokhara gave lambs with thick curly fleeces, whilst the lambs belonging to the second importation had open fleeces worth more than fur. The writer is of opinion that the fineness of the latter group of sheep is due to admixture with some Afghan Karakul possessing fine wool, and he proposes to call them the Afghan Karakul breed. It is easy to eliminate the fine wool characters in one or two generations by using a ram entirely free from fine wool.

Crosses between Karakul rams and Merino and Shropshire ewes do not produce good fleeces, but good results were obtained with Lincoln Longwool crosses and with red fat-tailed Persian sheep (*Ovis montanus*) which are free from short wool. The Persian sheep only produces good woolled lambs when crossed with the Astrakhan breeds and its wool is wrongly classed as fur in commerce.

(1) See also No. 282 B. March 1913; No. 553 B. July 1914.

There are six classes of sheep in Central Asia called Karakul by the Persians, and Arabi by the inhabitants of Bokhara, and they all derive from the small black Danadar sheep, now almost extinct. These are: 1) the Large Arabi or Duzbai sheep; 2) Small Arabi; 3) Medium Arabi, a hybrid between 1 and 2; 4) Grey Shiraz; 5) Zigois (these five classes are not very numerous); 6) Afghan Karakuls, which unfortunately constitute 90 per cent. of the fur classes of Bokhara, since, though they are hardy and produce excellent flesh like the other races, they only yield a fur of inferior quality unless crossed with rams of the other breeds. The small Arabi is the best breed and the Duzbai is quite factory and makes a good cross with our common sheep, increasing weight and improving the quality of the flesh. The writer is of opinion that the Afghan sheep is the ancestral form of the Merino. Sheep imported from Bokhara, besides being seldom free from fine skin, are too often inbred, since they come from small districts in the neighbourhood of railway stations (Tjardjui, Kara-Kul, Bokhara). The Karakul sheep imported into Russia, Germany and Austria are of very little value.

The Age of Goats according to their Teeth. — SCHEUNPFLUG, in *Berliner Tierärztliche Wochenschrift*, Year 30, No. 28, pp. 503-504. Berlin, July 9, 1914.

Most of the data at present available on the age of goats according to their teeth present considerable discrepancy and do not correspond to actual facts, for, as the present investigation proves, the appearance and replacing of the teeth takes place generally earlier than the above state.

According to the observations of Dr. Scheunpflug the central incisors are replaced at 14 to 16 months; goats which have their central permanent incisors up are, as a rule, upwards of one year old and seldom upwards of 23 months.

The 2nd pair of incisors change in general at 19 to 22 months. Goats which have their 2nd pair of permanent incisors up are above 17 months old but rarely over 34 months.

The 3rd pair are replaced mostly at 21 to 26 months and generally between 23 and 24 months. After the 3rd pair of permanent incisors are up the animals are, as a rule, above 19 and under 36 months old. Exceptionally however they may be older.

The corner incisors are generally replaced at between 29 and 32 months, most frequently between 32 and 36 months and in some cases even later than 38 months. Goats with the corner permanent incisors up are mostly upwards of 28 months old. (In judging the age of the jaws of dead animals the appearance of the third molars has also been taken into consideration, as well as when only the first three pairs of permanent incisors are up).

In most cases the permanent teeth are all up at 2 $\frac{3}{4}$ to 3 years.

In practice, in judging the age of goats by their incisors it may be assumed that in general the central pair are replaced at the age of 1 $\frac{1}{4}$

years, the 2nd pair at $1\frac{3}{4}$, the 3rd pair at 2 and the corner pair between $2\frac{3}{4}$ and 3 years. Thus the intervals between the replacement of each pair of incisors are about 6 months, about 3 months, and 9 months (more precisely from 6 to 12 months) respectively.

It sometimes happens that the two permanent incisors of a pair do not appear at the same time; if only one is up, the age should be reckoned a month less than if both are up.

The lack of permanent incisors, especially of the central pair, is in most cases due to oligodonty, which in some localities has been frequently observed.

In determining the age by the jaws of dead animals valuable data are furnished by the molars also, all the more so as the periods of their appearance and replacement in goats have a more restricted range than is the case with the incisors.

According to Dr. Scheunpflug the appearance of the molars in the lower jaw generally precedes that in the upper jaw. At the age of 3 months the first molar appears in the lower jaw and at 4 months the corresponding tooth in the upper jaw.

At the age of $5\frac{1}{2}$ months the first upper and lower molars are in wear. In some cases the second molars pierce through the gums in the lower jaw shortly before the eighth month, as a rule however, between 8 and 10 months, seldom later. In the upper jaw they appear between 8 and 10 months.

At 12 months the second molars are in wear. The change of the first molars takes place at from 17 to 20 months and at the same time in the upper and lower jaws. Sometimes one temporary molar is cut first, sometimes the other, as the replacing depends only upon accessory circumstances.

After the replacing of the above temporary molars, in general after these are in wear, the third molars are cut. They appear between 18 and 21 months, apparently a little later in the upper jaw than in the lower jaw.

All the third molars are up at between 18 and 24 months, and in wear not before 26 months. At the cutting of the third molars, it must be noted in general the 2nd and sometimes the 3rd pair of incisors are replaced.

Oligodonty of the molars was observed by the writer only in the 3rd pair.

The data found in the literature on the replacing of the teeth in sheep are compared with the writer's observations on goats. It appears that the termination of the period during which the incisors are replaced is nearly the same in goats as in early-maturing sheep (especially according to the data of Cornevin and Lesbire). There is nevertheless a small difference in that the period between the replacing of the first and second pairs of incisors in sheep is about two months shorter than in goats. On the other hand the interval between the 2nd and 3rd pairs is shorter in goats.

The temporary molars are certainly replaced earlier in goats than in sheep, as, according to the writer, the premolars are replaced in goats

ly before the cutting of the third molar, while in sheep this happens after the cutting of the latter or at the same time.

The Rearing of Reindeer in Alaska (1). — CHUBBUCK, LEVI (Office of Farm Management, Bureau of Plant Industry, U. S. Department of Agriculture), in *The Journal of Heredity*, Vol. V, No. 4, pp. 149-154 + 3 figs. Washington, April 1914. The introduction of the European reindeer into Alaska was recommended by Prof. S. F. Baird in 1851, notwithstanding the fact that the indigenous American caribou is capable of domestication. This suggestion also made by Townsend in 1867, and in 1892 Dr. Sheldon Jackson, then general of the Bureau of Education in Alaska, introduced a small number of domesticated European reindeer, which was followed by others. As a result of breeding, their number now reaches 40 000 and has transferred the native people from hunters and fishermen to herdsmen.

The reindeer indigenous to North America are: *Rangifer arcticus* (tundra-ground Caribou), inhabiting the extreme north, and *R. caribou* (moose or woodland Caribou) in the wooded region south of the former. This species differs slightly from that of the old world (*R. tarandus*). At present no attempt has been made to domesticate it, though it is possible when crossed with the domestic reindeer; this character is valuable, as the native species are larger and stronger than the imported species which appears to show signs of degeneration. The present area of undeveloped land in Alaska that would be suitable for rearing reindeer is estimated at 100 000 square miles, capable of supporting 10 million deer. The most suitable region is north of the Yukon river. The reindeer lichen (*Cladonia rangiferina*) occurs throughout the arctic region of Alaska, in the Seward peninsula, in the tundras of the west and in the mountains of the Alaska chain and of the Alaska peninsula.

Reindeer do not require shelter; in fact they require no care beyond feeding. Almost half of the present herds are in the Seward peninsula, the remainder are distributed as far as Point Barrow on the Arctic coast in the Alaska peninsula and to Tanana towards the Yukon river. They belong to Eskimos, Indians and a few Laplanders; the latter were left over with the animals by missionaries to teach the care of the deer. Some herds belong to the Government. The Alaska Division of the U. S. Bureau of Education, Department of the Interior, looks after the herds, through the masters of the Government native schools.

In 1911 a hundred carcasses were sent from Nome to Seattle and sold for 75 cts. per lb. Up to the present the Alaska markets have consumed the reindeer flesh which is produced. A dressed carcass averages 130 lbs. in weight; the butcher buys the dressed carcasses at about 10 cts. per lb. The most suitable age for slaughtering the animals is 3 years, *i. e.* after they have been worked for 5 or 6 years. The cows are rarely milked in Alaska; any milk obtained is consumed fresh after being mixed with water or as cheese; butter is never made, since the fat has a rancid flavour. There is a heavy loss amongst the young animals owing

1) See also No. 1186, *B. Oct.* 1913 (Reindeer in Newfoundland).

(E4).

ing to the unscientific method of rearing introduced by the Laplanders and the tundra fires, so that the rate of increase of the reindeer is only half that of herds of cattle.

932 - Winter Egg Records in Ireland. — *Department of Agriculture and Technical Instruction for Ireland, Journal*, Vol. XIV, No. 3, pp. 546-547. Dublin, April 1911.

The data presented are from records kept in Ireland under the control of the Department.

TABLE I. — Average number of eggs per hen during the six months October to March.

Breed.	1908-09	1909-10	1910-11	1911-12	1912-13
White Leghorn	44.3	39.7	41.5	45.1	42.4
Brown Leghorn	40.7	42.1	37.9	49.3	51.8
Black Leghorn	—	—	—	—	64.3
Minorca	32.8	38.0	48.3	48.3	86.5
Buff Orpington	54.5	42.4	45.2	42.6	49.1
White Orpington	50.7	48.7	54.1	52.6	44.1
White Wyandotte	56.6	34.2	45.2	45.8	42.9
Faverolle	42.5	41.5	35.7	28.8	42.2
Plymouth Rock	35.9	39.2	45.5	36.5	43.1
Ancona	—	—	—	64.9	—
Houdan	59.2	58.5	62.5	58.0	73.8
Andalusian	—	71.3	—	—	—
Rhode-Island Red	—	—	63.9	61.9	49.1
Light Sussex	31.6	32.1	39.8	41.8	38.4
Red Sussex	—	—	—	—	—
Mixed pure breeds	39.7	—	—	—	—
Mixed breeds	40.8	41.9	40.5	41.6	43.7
Average	42.3	40.7	42.7	41.8	44.2

TABLE II. — Variations in different strains of the same breed.

Breeds	Average of all flocks	Average of the best flock	Average of worst flock
White Leghorn	47.4	75.0	31.1
White Wyandotte	33.9	53.3	22.6
Faverolle	34.9	57.8	21.1
Plymouth Rock	38.8	60.8	20.6
Rhode-Island Red	48.4	59.1	28.1
Light Sussex	49.7	72.4	38.1
Mixed breeds	42.4	78.6	16.1

submitting the breeds of which the returns relate to less than 100 the following is the order: Light Sussex, Rhode Island Red, White orn, Plymouth Rock, Faverolle, White Wyandotte. The egg-laying capacity of the different strains of the same breeds considerably, as shown in Table II.

Attempts at Breeding the Great White Heron and the Buff-Backed Heron (Little Egret) in Madagascar. — GUILHELM, in *Colonie de Madagascar et Dépendances, Bulletin Économique*, Year 13, No. 4, pp. 472-476. Antananarivo, 1913.

With a view to protecting the great white heron and the buff-backed in Madagascar, an Order was issued on May 3, 1913, forbidding being shot in the island. These two species are valuable for their age and the second is a very useful bird, as it feeds almost exclusively on cattle ticks, which often spread contagious diseases. The writer, who observed that the Malagasy kept birds caught young in a state of domesticity, thought of the possibility of breeding them economically. He tried keeping them in cages and fed them with raw meat and his attempts have been successful, and the cutting of the feathers has been found more advantageous than plucking them. M. Guilhelm states that breeding these birds would be especially suitable in the northern north-eastern provinces of Madagascar.

New Research on the Visual Power of Bees. — VON HESS, in *Die Naturwissenschaften*, Year 2, Part 34-35, pp. 836-838. Berlin, August 28, 1914.

The writer reports upon a series of experiments, all of which agree showing that it is quite out of the question to think that bees have a sense of colour in any way comparable with that possessed by man.

Apiculture in Ireland. — *Daily Consular and Trade Reports*, Year 17, No. 167, p. 342. Washington, July 18, 1914.

The importance of apiculture in Ireland may be judged from the following statistics of production:

	Average	
	1901-1910	1911
	lbs.	lbs.
<i>Bees with removable combs:</i>		
In honey	69 291	91 450
Clover honey	262 253	422 862
Total	331 544	514 312
<i>Other bees:</i>		
In honey	89 123	69 254
Clover honey	29 004	27 737
Total	118 127	96 991
Grand total	449 671	611 303

Of the 611 303 lbs. produced in 1911, the two eastern Provinces of land supplied the bulk, Ulster giving 204 784 lbs., while Leinster nished 181 354 lbs.; the western Provinces (Munster and Connaught) supplied 132 387 and 92 778 lbs. respectively.

The abundance of vegetation and flowering plants has always a tendency to encourage the production of honey in Ireland.

The usual price paid to producers for comb honey is 9d. per lb., the retail price is 1d to 2d higher.

Under the Bee Pest Prevention Act (Ireland, 1908) any swarms infested with disease of whatever description may be ordered to be destroyed by local committees of agriculture, with the approval of their respective county councils. Compensation is rendered for all such enforced destruction in 1913 the aggregate sum set aside for this purpose was approximately £ 257.

936 - Collection and Exportation of the Wax of Wild Bees in the African Colonies.

MICHEL, E. (Agricultural Engineer at the Ministry of the Colonies) in *Bulletin agricole du Congo Belge*, Vol. V, No. 2, pp. 385-395 + 6 figs. Brussels, June 1914.

This paper contains information on the wild bees' honey in the African colonies, a description of the native methods of bee-keeping in the Belgian Congo, in the Sudan and in Tunis, and of the improved methods of separating wax (melting by solar heat, in a stove, in boiling water).

The trade in wild beeswax is constantly increasing in most of the African colonies, especially in Gambia, Gold Coast, Nigeria, Angola, South Uganda, British East Africa, German East Africa, Mozambique. A few years ago the exportation of wax from these countries was almost insignificant, while now it amounts to thousands of tons. Wax occupies the third place in the export trade of Angola (Berguela supplying 90 per cent. of the exports of the whole province). Angola exports every year 600 or 700 tons of wax; Mozambique about 100; Portuguese Guinea. The wax is exported in cakes weighing 253 to 264 lbs. each. The quantities of wax exported during the last few years from German East Africa and from the British African colonies are given by the following table:

Colonies	Year	Exports of wax	
		weight lbs.	value £
German East Africa	1911	802 347	40 488
Gambia	1912	29 498	1 154
Nigeria	1913	12 862	381
Uganda	1912-1913	263 408	—
British East Africa	1912-1913	139 207	7 522
Nyasaland	1912-1913	110 639	5 478
Sudan	1912	43 704	2 319

Wild beeswax when well purified is comparable to European wax. Central Administration of the Belgian Congo had some samples of from the colony examined, and among them many of good quality found. Bees are widely spread in the Belgian Congo; the natives eat honey but do not make any use of the wax, the value of which is known to them.

FARM ENGINEERING.

Stump Burning to Reclaim "Logged-off Lands". — ALLISON, LE ROY W., in *Engineering Record*, Vol. 70, No. 4, pp. 95-96. New York, July 23, 1914.

In the Pacific North-West of the United States there are extensive lands called "logged-off" lands upon which forest trees have been felled which are now covered with stumps varying from 3 to 6 ft. in diameter, intermingled with a successive growth of trees and underwood.

With proper clearing these logged-off lands are very valuable for agricultural purposes. Many methods have been employed for freeing the lands of stumps, such as grubbing, burning, blasting and pulling.

The cost per acre of clearing lands varies considerably with the character of the subsoil, condition of land, etc., but as an average the following may be taken :

Method	Average cost per acre
Powder and horse puller	\$ 110
Donkey engine.	90
Powder and grubbing	80
Powder and burning	70

A complete land-clearing plant has recently been devised, overcoming many of the disadvantages of the various methods noted and combining most of their advantages. It is known as the Blake land-clearing machine and consists of a five-fire Pluto stump burner, a saw, a power grubber and stump pullers, the whole being operated by a gasoline engine.

The stump burner is operated by a blower on the machine; a line of pipe connects the blower to a sheet-iron hood, which is made in four pieces and is set over the stump to be destroyed. The use of the burner is simple: a hole is bored down through the centre of the stump and a small explosive cartridge is employed to split it apart. This splitting, while essential, facilitates the fire started at the top of the stump to gain headway. The hood is then placed over the stump and banked with a little earth at the bottom and forms a closed but not air-tight chamber. The fire is started and the pipe connection from the blower made, after which a constant downblast is turned on the flame. Stumps are consumed in this manner in from 2 to 4 hours or more according to size. Upon removal of the hood the fire is covered with earth, allowing roots to charpit to the ends.

Official tests of the burner have been made. During one of the old water-soaked stump 20 feet in circumference at the base, 13 ft. at the top and 4 ft. high was consumed in 6 hours; the total cost was £ divided into 75 cents for gasoline and 40 for explosives.

The method of operating the whole outfit is to set it in a corner of land to be cleared: five stumps on the immediate vicinity are split, fire placed under the blower blasts. Meanwhile second-growth trees are cut out and sawed into cordwood, the roots and snags burned and the undergrowth and small roots are removed with the power grubber. Subsequently the machine is removed to another position and these operations repeated. By this method a strip of 50 to 100 ft. wide is left ready for sowing and seeding while the outfit is engaged clearing other sections, the work being done rapidly at a reduced cost and without waste of valuable vegetable mold.

938 - **The Garrett-Crawley Agrimotor.**—*The Implement and Machinery Review*, No. 471, p. 375. London, July 1, 1914.

At the Suffolk Agricultural Association's show, held at Bury St Edmunds on June 4 and 5, a new tilling machine, the Garrett-Crawley motor, was shown at work. As can be seen from the accompanying



Garrett-Crawley Agrimotor.

it is self-contained and controlled by one man from a seat in the rear petrol-driven engine which is situated in front nicely balances the plough shares at the back, so that at the end of the furrow the operator may turn his seat and turn the machine round in its own length on either of the travelling wheels with the utmost ease.

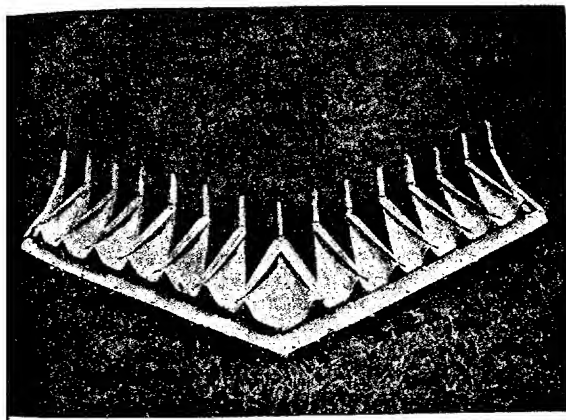
The levers for regulating all the movements of the apparatus are in reach of the operator, one being provided for lifting and lowering the plough and others for declutching either of the wheels, for going forward, stopping or backing, besides a handle for steering. The engine is 25 H P; it runs at 1 000 revolutions per minute and can turn over 12 acres per hour to a depth of 5 inches.

When ploughing, one of the road-wheels is raised by means of a hand wheel and worm as high as the depth of ploughing required, while for travelling along a road the plough can be raised by the adjustment of a road wheel below the driver's seat.

Although primarily a plough, any other farm implement may be attached to and worked by the agrimotor.

The "Welsh" Bracken Cutter. — *The Implement and Machinery Review*, Vol. 40, No. 471, p. 390. London, July 1, 1914.

One of the newest implements for the control of bracken is Welsh's bracken cutter. As will be seen from the accompanying figure it consists of a V-shaped frame carrying 15 runners turned up in front, shod with



The « Welsh » Bracken Cutter.

and fixed together at the rear by a specially tempered steel plate. The curve given to the front of each runner, together with its individual flexibility, makes easy the "jumping" of any obstruction; the cutting blades and guide plates are so fixed that every bracken stalk which finds way between the runners is sliced down. The frame, too, is flexible

to enable the machine to keep in close contact with the ground. The implement weighs 1 cwt., is 6 ft. wide and is easily drawn by a horse or 1

Three or four cuttings may be required the first season and three in each of the next three years.

940 - *The Articulated Yoke.* — MANRIN, G., in *Journal d'Agriculture Pratique*, Vol. 1, No. 23, pp. 719-722. Paris, June 4, 1914.

M. A. Guérineau's yoke, exhibited at the last Paris Agricultural Show, presents the advantage of maintaining the usual way of fixing the draught yoke to the poles of vehicles or to draught chains and at the same time allowing a great freedom of movement to the head of each animal.

The yoke consists of two head-pieces, *A, B* (see figs. 1 and 2), of the single-yoke type jointed to the cross-piece *C* which carries the draught gear *T* for the pole or chain.

The head-piece is placed on the neck of the bullock and is attached to the horns with the usual thongs.

In the middle and on the top of each head-piece is fixed a plate (see section, fig. 3), the top of which bears a pin, *b*, on a turning joint, allowing the pin sufficient play to describe an inverted cone; the upper part of *b* is a screw carrying the nut *e*, which causes the cross-plate *c* to press moderately against the plate *a*, allowing a certain amount of play. The plate *c* is strongly fixed by the bolts *d* to the cross-piece. When the nut *e* is in a suitable position, it is fixed there by a hinged pin *k*, fitting on the square extremity of the pin *b*.

It will be seen in figs. 1 and 2 that the upper surface of the plate is flat, while the under face of plate *c* is a segment of a sphere, thus allowing the pin *b* to move on its turning joint. Fig. 2 shows that plate *a* has two projections, *n, n*, and that the corresponding gaps, *m, m*, in plate *c* the cross-piece *C* are somewhat larger than the projections, so as to allow them play-room and to permit the cross-piece *C* to assume an oblique position in the horizontal plane. The result is that the heads of the animals enjoy a relative freedom of motion both in the vertical and horizontal directions and independently of each other.

The draught gear, *T*, can be shifted along the cross-piece, *C*, so that when animals of different strength are harnessed together the weaker can be given some relief by the longer lever-arm.

This yoke costs about 31s. It weighs only about 33 lbs., or 11 lbs. more than the usual yoke.

941 - Review of Patents.

Tillage machines and implements.

Austria	66 122. Weeding machine.
	66 134. Coulter-holder for ditching ploughs.
	66 253. Device for regulating the depth of work of gang ploughs.
	66 263. Apparatus for ploughing-in all kinds of manures by plough machines.
Belgium	264 848. Device for fixing the extensible axle in the fore-carriage of ploughs.
	264 850. System of fixing the adjustable point of ploughshares.
	165 027. Plough.

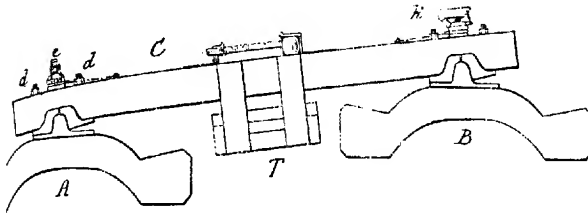


Fig. 1.

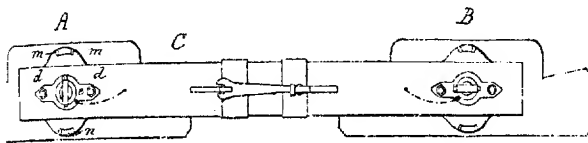


Fig. 2.

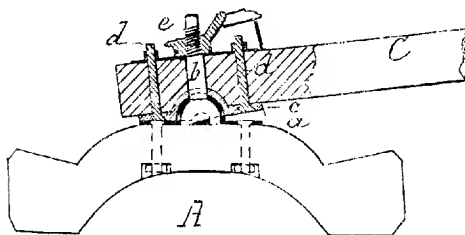


Fig. 3.

GUÉRINAU'S. — Articulated Yoke.

- Canada 153 923. Plough coulter.
 Germany 203 626. Tilling implement with harrow teeth and hoes.
 273 777. Motor tilling machine with spades turning sideways also
 273 907. Turn-wrest plough with revolving beam.
 274 139. Turn-wrest plough.
 274 141. Driving wheel for motors, especially for ploughing.
 274 435. Plough with jointer.
 274 436. Plough for motor traction.
 Hungary 63 459. Balance plough.
 63 509. Plough with revolving screw in front of share.
 63 521. Implement for hoeing and rolling between rows of beets.
 63 601. Turn-wrest plough.
 63 656. Hoeing and banking machine.
 64 631. Rotary digger.
 63 686. Motor plough.
 63 719. Horse-hoe.
 63 777. Electric auxiliary apparatus for two-engine ploughing.
 64 111. Cultivator hoes.
 64 214. Gang plough.
 64 243. Hoes for rotary diggers.
 64 307. Fork-like supports for mouldboards.
 64 346. Apparatus for machine ploughing.
 64 414. } Improvements in motor ploughs.
 and }
 64 436. }
 64 430. Motor windlass for ploughs.
 64 506. Harrow.
 Italy 140 763. Improvement in tractor ploughs.
 134 426. Tillage machine.
 140 516. Improvement in the driving of windlasses in machine plough
 140 369. Rotary digger.
 153 755. Pulifici's new system of haulage for ploughs.
 141 143. System of lubricating ploughshares with water, or water
 with other substances, by means of the hollow bolts
 fix the share and mouldboard to the body of the plough
 141 594. Improvement in disk harrows.
 136 513. Innovations in ploughs.
 140 406. Tractor for ploughs with steering wheel or system of
 wheels situated in front of driving wheel.
 United Kingdom 1 816. Motor ploughs.
 2 400. Motor plough hauling itself along a rope anchored at head
 3 455. Weeding and cultivating machines.
 3 458. Land rollers.
 3 578. Cultivating machine for digging or pulverizing land.
 3 651. Land-cultivating machine.
 3 966. Ploughs.
 4 496. Rotary tool for cultivators, etc.
 5 254. Spade, shovel and fork handles.
 United States 1 097 908. Pulverizing and smoothing harrow.
 1 099 080. Potato hiller and weeder.
 1 099 877. Adjustable subsoiler attachment.
 1 099 304. Cultivator shovel.

- 1 099 897. Ploughshare.
- 1 100 395. Pulverizing implement for the treatment of fallow and other land.
- 1 100 620. Deep tilling attachment.
- 1 100 938. Sulky plough.
- 1 100 988. Five-horse cultivator equalizer.
- 1 101 348. Gang plough.
- 1 101 158. Plough coupling.
- 1 100 920. Subsoil plough.
- 1 101 777. Hitch for gang ploughs.

Manure distributors.

- 153 402. Manure spreader.
- 153 453. Fertilizer distributor.
- 468 069. New manure spreader for vineyards.
- 141 770. New manure spreader for vineyards.
- 1 098 502. Manure loader.
- 1 099 845. Manure spreader.

Drills and sowing machines.

- 66 138. Feed wheel for potato planters.
- 66 140. Feeding gear for potato planters.
- 66 245. Potato planter.
- 66 254. Drill with force feed and hopper with moveable back.
- 153 399. Double disc attachment for drills.
- 18 970. Sowing machine for beets, cabbage and beans.
- 274 232. Apparatus for sowing grass seeds.
- 63 504. Drill.
- 63 661. Attachment for wheels to prepare holes for planting potatoes.
- 64 226. Device for drill hoppers.
- 64 474. Potato planter.
- 140 732. Disk distributor for sowing machines.
- 140 609. Knapsack sowing machine.
- 140 639. Beet sowing machine and manure spreader combined.
- 125 117. Hand sowing machine with distributing disk driven by a cord.
- 2 869. Agricultural drills.
- 5 765. Seed drill.
- 1 097 611. Land marker for planters.
- 1 098 416. Sowing machine.

Reapers, mowers, etc.

- 153 448. Binder tractor.
- 153 451.)
- and) Binder mechanism.
- 153 506.)
- 153 508. Bundle carrier.
- 153 509. Loader for binders.
- 153 523. Harvester mechanism.
- 153 936. Harvester cutting mechanism.
- 153 976. Shocker.
- 153 999. Sharpener for lawn mower.
- 154 006. Shocking machine.
- 469 569. Universal fore-carriage for harvesting machines.

Germany	273 728. Tedder with adjustable tine bars.
Hungary	63 723. Improvements in two-axle motor mowers.
	63 788. Mower.
	61 023. Mower with circular knife.
	64 062. Steering gear for mowing and reaping machines.
	64 289. Implement for tying sheaves.
Italy	138 157. Complete mower cutter-bar with two cutting sections moved alternate directions and light divider.
	140 560. Rotatory mower.
	139 881. Sharpener for blades of mowers.
	131 477. Side delivery rake.
	141 768. Process and apparatus for hardening scythes by compression curving them.
	141 785. Counting apparatus for binders.
Switzerland	65 865. Canvas for binder.
	66 053. Swath rake.
United Kingdom	1 574. Lawn mowers.
	1 751. Harvesting flax.
	4 108. Mowing machine swath board.
	4 820. Mowing machine.
	5 892. } Side-delivery rakes.
	5 993. }
	6 251. }
United States	1 097 821. Mowing machine divider rod attachment.
	1 097 693. Corn harvesting machine.
	1 099 495. Flax and grass seed harvester attachment for mowing mach
	1 099 407. Harvester.
	1 099 591. Corn topper.
	1 101 393. Sugarcane harvester.
	1 101 758. Mowing machine.
	1 101 607. Corn gathering and husking machine.
	<i>Machines for lifting root crops.</i>
Belgium	265 299. Potato lifter.
Denmark	18 875. Beet-topping machine.
Germany	274 307. Potato lifter with side wheel, one share for cutting the r one for lifting the potatoes into a drum-shaped sieve run on the ground.
Hungary	63 992. Beet topper.
United Kingdom	1 072. Potato harvester.
	4 334. } Potato diggers.
	and }
	5 178. }
United States	1 097 990. Potato digger.
	1 099 414. Beet topper and harvester.
	1 099 643. Beet harvester.
	1 101 584. Topping device for sugar-beets.
	<i>Threshing and winnowing machines, etc.</i>
Austria	66 121. Cereal husking machines.
Belgium	{ 264 857. } and } Threshing machines. { 265 195. }

- 153 796. Thresher.
- 468 340. Improvements in the mechanical feeders for threshing machines.
- 274 233. Step-shaped caving riddle for threshers.
- 63 569. Improvement in threshers.
- 63 637. Winnowing and grading machine.
- 64 612. Regulator for winnowers.
- 64 055. Sack stand for threshers.
- 140 886. Automatic feeder for threshers.
- 65 886. Sheaf opener.
- 66 314. Apparatus for cleaning, sorting and airing grain.
- 3 663. Threshing machine.
- 5 958. Dust-removing apparatus for threshing and other agricultural machines.
- 1 098 560. Grain thresher.
- 1 098 803. Grain separator.
- 1 099 339. Corn sheller.
- 1 100 150. Threshing machine.
- Other agricultural machines.*
- 65 908. Ribbon-shaped earmarks for animals and pincers for same.
- 66 124. Apparatus for taking electricity from a line for electrically-driven agricultural machines.
- 66 244. Motor lorry with windlass.
- 66 249. Iron wheel for agricultural machines.
- 66 258. Apparatus for hammering scythes.
- 66 142. Drive for butter-making machine.
- 66 144. Injector.
- 66 252. Apparatus for destroying insects.
- 66 259. Groat mill.
- 153 403. Tractor.
- 153 416. Tractor truck.
- 153 433. Straw spreader.
- 153 465. Hay stacker.
- 153 471. Egg turner.
- 153 485. Stump puller.
- 153 525. Hay loader.
- 153 555. Milking machine.
- 153 612. Grain steeping machine.
- 153 686. Churn.
- 153 800. Butter-making machine.
- 153 826. Fruit evaporator.
- 153 845. Milking apparatus.
- 153 863. Fruit-packing implements.
- 153 916. Loader for hay.
- 18 967. Teat cup.
- 18 995. Bruising mill.
- 19 002. Mill.
- 19 029. Automatic crib.
- 273 569. Apparatus for electric automotor agricultural machines.
- 273 729. Apparatus for cleaning and removing rust from chopped fodder.
- 273 730. Device for fixing ladders to trees.
- 274 140. Three-wheeled tractor with driving fore-wheel for agricultural machines.

- 274 182. Fodder truck with inclined bottom and side apertures ^{top}
by sliding panels.
- 274 183. Automatic feeding device for live stock.
- 274 184. Automatic trapdoor for poultry houses.
- Hungary 63 510. Apparatus for tying bundles of straw, sticks, etc.
- 63 786. Potato peeler.
- 63 805. Apparatus for unloading carts.
- 64 385. Chaff-cutter with fan.
- 64 361. Cabbage and beet slicer.
- Italy 140 419. Improvement in plunger pumps for sprayers.
- 140 913. Machine for cutting the roots of hemp.
- 141 154. Universal grape crusher and must separator.
- 140 894. Process and apparatus for extracting oils by pressure.
- 140 460. Mechanical lifting apparatus for straw elevators.
- 141 707. Yoke.
- 140 175. Automatic jet for water or other liquids.
- 141 937. New sulphurer with moveable horizontal cylindrical sieve
- Switzerland 65 867. Moveable hothouse.
- 65 908. Mechanism for dried milk works.
- 65 911. Apparatus for flaying animals.
- 66 054. Automatic loading of hay-carts.
- 66 058. Device in concrete mangers for the watering of cattle.
- 66 117. Apparatus for emptying vacuum milking machines.
- 66 250. Box for conveyance of cattle.
- 66 251. Device for preventing horses from shying.
- 66 312. Apparatus for sterilising milk and other liquids that are
decomposed by heat.
- 66 313. Apparatus for producing a uniform degree of moisture in
- United Kingdom 987. Trap nests for poultry.
- 1 015. Portable feeding device for draught animals.
- 1 504. Delinting cotton seed.
- 1 668. Cow milkers.
- 1 672. Fastenings for butter churns.
- 2 028. Apparatus for sterilizing soil.
- 2 069. Appliance for cutting up maize stalks.
- 2 353. Moulding device for making hay ricks, corn stacks, etc.
- 2 766. Apparatus for preparing peat.
- 2 927. Centrifugal separators.
- 3 138. Apparatus for preparing cultures of lactic bacteria.
- 3 193. }
and } Cutters for tapping rubber trees.
3 350. }
- 3 248. Hop-picking machine.
- 3 262. Potato grader.
- 3 333. Kneading machine.
- 3 364. Cow milkers.
- 3 534. Butter blender.
- 3 610. Cotton gin.
- 3 830. Milk churn lids.
- 4 202. Cotton-picking machine.
- 4 400. Brushes for killing insects.
- 5 686. Machine for decorticating nuts.

- 5 687. Mill for cracking nuts.
- 5 900. Fruit-picking appliance.
- 6 037. Bale tying-tongs.
- 6 180. Cow milkers.
- 6 183. Egg-testing devices.
- 6 314. Sugarcane mills.
- States 1 097 887. Grain and seed cleaner.
- 1 097 853. Horse hay fork.
- 1 098 221. Implement for transplanting and replanting small plants.
- 1 097 723. Steering device for traction engines.
- 1 098 602. Baling press alarm.
- 1 098 553. Hay stackers.
- and 1 099 190. Hay stackers.
- 1 099 088. Tongue truck.
- 1 099 319. Wire fence stretcher.
- 1 099 311. Hay loader.
- 1 099 538. Traction engine.
- 1 099 778. Bean separating machine.
- 1 099 201. Handhold for implements.
- 1 100 123. Draught equalizer.
- 1 100 592. Baling press.
- 1 100 370. Adjustable wagon tongue.
- 1 100 350. Apparatus for raising and lowering vehicle bodies.
- 1 100 908. Cotton picking machine.
- 1 109 968. Grain shock scoop.
- 1 100 950. Fodder cutter discharge-pipe.
- 1 100 970. Windmill oiler.
- 1 101 170. Hay carrier.
- 1 101 543. Windmill.
- 1 101 856. Seed corn tester.

Fig Sty with Device for Protecting Sucking Pigs and Keeping them Warm. — *deutsche Landwirtschaftliche Presse*, Year XI, I, No. 25, p. 315. Berlin, March 28, 1914. Pig breeders often suffer losses through the sucking pigs being crushed by their mothers. As a means of preventing such accidents a special apartment is sometimes set apart for the sucking pigs; recently Herr mann has taken out a patent (No. 271 340) in Germany for warming compartment and thus inducing the young pigs to stay there permanently.

The accompanying figs., 1 and 2, show the new sty in plan and on. It is about 6 ft. 6 in. × 10 ft. and provided as usual with a trough at one end. At the other end a pit about 10 inches deep 20 wide runs all along the side of the sty; it is covered by a double iron cover, with an air-space between the two sheets, laid flush with floor. This box cover can be heated either by a few petroleum lamps under it or by steam or electricity; *b*¹ and *b*² (fig. 2) are openings for the admission of air and for the escape of the products of combustion. About 14 inches above the warm surface a plank, *f*, is fixed horizontally to the wall. Besides this a rail of wood about 6 in. square is laid on the floor and fixed at 20 to 28 inches from the pit and parallel to it.

The sucking pigs, as experience has proved, seek the warmest place in the sty, that is the sheet-iron cover (on which soft straw is laid), which

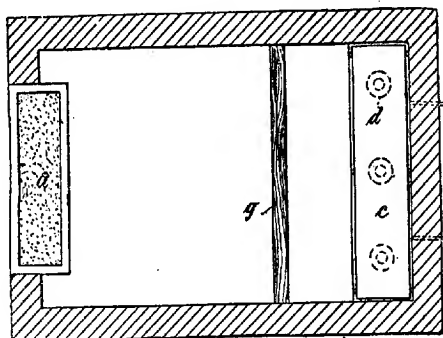


Fig. 1. — Sty for brood sow. — Plan.

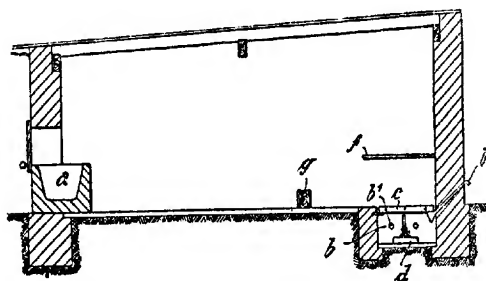


Fig. 2. — Sty for brood sow. — Longitudinal section.

the mother is kept off it by the plank, and lies down with her back against the rail *g* to suckle her offspring, which are thus absolutely safe from danger of being crushed.

RURAL ECONOMICS.

943 — Book-keeping Statistics on the Profitableness of Bee-keeping in Switzerland in 1912-13 (1). — Report of the Swiss Peasants' Secretariat, in *Schweizerische Bauern-Zeitung*, No. 8. Aarau, August 1914.

This Report contains the results obtained by 28 bee-keepers entered on the books of the control section of the Association of Swiss Bee-keepers.

(1) For the results of the 1912 enquiry included in the preceding Report of the Swiss Peasants' Secretariat, see No. 170, *B.* Feb. 1914. (Ed.)

the year 1912, and by 25 entered for 1913. These have kept regular accounts of their apiaries according to the uniform method adopted by the section, and have placed them at the disposal of the Association, which then handed them over to the Swiss Peasants' Secretariat to check and work up statistically.

In order to illustrate the method that has been followed The Table on pages 1356-1357 gives the principal figures of these statistics.

The economic results of these 25 bee-farms cannot be generalized; nevertheless they confirm the well-known fact that both 1912 and 1913 had bee years in Switzerland. From the experience gained by the Peasants' Secretariat in the matter of statistics of farm book-keeping, it seems that the accounts of 100 bee farms would be sufficient to draw conclusions for the whole country.

Carefully made statistics of the accounts of bee-keepers in Switzerland extend not only to each bee-keeper who keeps regular accounts, but also to the collectivity of bee-keepers. Consequently the Association of Swiss bee-keepers solicits the co-operation of a greater number of contributors in statistical enquiry, with the object of being enabled to draw general conclusions; for this purpose it supplies at a moderate price the forms for keeping accounts.

AGRICULTURAL INDUSTRIES.

Wine Making without Refrigeration in Warm Countries. — GAUVRY, E., in *Bulletin de la Direction Generale de l'Agriculture*, Year 18, No. 78, pp. 389-409. Tunis, June 1914.

Refrigeration is generally considered as the final solution of the difficulties of making wine properly in warm countries. Even if not properly used it produces finer wines, richer in bouquet. But refrigeration, whether curative or preventive, requires expensive and extensive plantations, the amount of vintage to be converted into wine daily becomes considerable, and though, notwithstanding its high cost, it is still the best means of ensuring a perfect vinification even during the most violent sirocco, it is frequently difficult or impossible to use on account of the insufficient quantity and sometimes total lack of water at vintage time.

It thus became necessary to discover palliatives in order to obtain good products with good keeping qualities in spite of the unfavourable conditions obtaining during the time of wine making. In Algeria this has been attained by the systematic use of sulphurous anhydride in heavy doses, either at the moment the vintage is placed in the vats or during the process of fermentation. But in Tunis the conditions of fermentation are more unfavourable than in Algeria, so that the writer considers it necessary to know exactly how sulphurous anhydride behaves towards the different parts of must and what are its chemical and biological effects, in order to get the maximum benefit from its judicious use.

	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500	501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	524	525	526	527	528	529	530	531	532	533	534	535	536	537	538	539	540	541	542	543	544	545	546	547	548	549	550	551	552	553	554	555	556	557	558	559	560	561	562	563	564	565	566	567	568	569	570	571	572	573	574	575	576	577	578	579	580	581	582	583	584	585	586	587	588	589	590	591	592	593	594	595	596	597	598	599	600	601	602	603	604	605	606	607	608	609	610	611	612	613	614	615	616	617	618	619	620	621	622	623	624	625	626	627	628	629	630	631	632	633	634	635	636	637	638	639	640	641	642	643	644	645	646	647	648	649	650	651	652	653	654	655	656	657	658	659	660	661	662	663	664	665	666	667	668	669	670	671	672	673	674	675	676	677	678	679	680	681	682	683	684	685	686	687	688	689	690	691	692	693	694	695	696	697	698	699	700	701	702	703	704	705	706	707	708	709	710	711	712	713	714	715	716	717	718	719	720	721	722	723	724	725	726	727	728	729	730	731	732	733	734	735	736	737	738	739	740	741	742	743	744	745	746	747	748	749	750	751	752	753	754	755	756	757	758	759	760	761	762	763	764	765	766	767	768	769	770	771	772	773	774	775	776	777	778	779	780	781	782	783	784	785	786	787	788	789	790	791	792	793	794	795	796	797	798	799	800	801	802	803	804	805	806	807	808	809	810	811	812	813	814	815	816	817	818	819	820	821	822	823	824	825	826	827	828	829	830	831	832	833	834	835	836	837	838	839	840	841	842	843	844	845	846	847	848	849	850	851	852	853	854	855	856	857	858	859	860	861	862	863	864	865	866	867	868	869	870	871	872	873	874	875	876	877	878	879	880	881	882	883	884	885	886	887	888	889	890	891	892	893	894	895	896	897	898	899	900	901	902	903	904	905	906	907	908	909	910	911	912	913	914	915	916	917	918	919	920	921	922	923	924	925	926	927	928	929	930	931	932	933	934	935	936	937	938	939	940	941	942	943	944	945	946	947	948	949	950	951	952	953	954	955	956	957	958	959	960	961	962	963	964	965	966	967	968	969	970	971	972	973	974	975	976	977	978	979	980	981	982	983	984	985	986	987	988	989	990	991	992	993	994	995	996	997	998	999	1000
of which : sold	17	9	3	6	7	3	13	8.4	4	8.5																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													

The ferment of wine presents, according to climate and locality, varieties or strains which impart to the product obtained a special bouquet but this differentiation is caused also by a natural selection produced by adaptation to environment, to the conditions of wine-making and to the composition of which is not invariable and the elements of which are modified by outside factors.

In warm countries, where the grapes attain full maturity, they are covered by very vigorous and active ferments: these are already adapted to the manner of fermentation of the country and it is they that have to be selected in order to obtain the best results when only wine for current consumption are considered. Commercial selected ferments, as in Tunis too uncertain results to allow of their employment except as a means of increasing the regularity of fermentation. Sulphurous anhydride, even in moderate doses, ensures a sufficient purification. But the ferment of mannitic fermentation and that which causes the turning of wine red and they are all the more dangerous inasmuch as their development is favoured by high temperatures. Their evolution may be stopped by increasing the acidity of the medium. Without this circumstance their presence would be permanent in Tunisian wines, the musts of which are always too rich in sugars, with a relatively too low acid content. One may not hesitate to acidify by means of tartaric and citric acid; but while citric acid presents remarkable advantages its use is much restricted by legislation. With the assistance of acidification the treatment of must with sulphurous anhydride ensures from the very beginning a practically sufficient bacterial purification to allow fermentation to set in and to develop in the best conditions.

This is the moment in which, in warm countries, the enlightened practical wine maker must interfere to dominate the evolution of the ferments and moderate their activity, as under such conditions they always have a tendency to act too rapidly. The rise in temperature which is so serious to them is due chiefly to this excess of activity. Ferments, though aerobic, continue to proliferate even when they are deprived of oxygen; further, their activity continues by the emission of a special diastatic zymase, which has the property of instantly transforming grape must into alcohol and carbon dioxide, and which does not appear except under anaerobic conditions. The use of large amounts of sulphurous acid is based on these facts, as it obliges the ferment to live from the beginning of anaerobic life in a de-oxygenized medium. On the other hand it is not that in order to start fermentation in musts treated with sulphurous acid a ferment in full activity, whose cells have lived in contact with air, is necessary to ensure the maximum of diastatic activity, is necessary. For this purpose an abundant ferment is prepared and the must is leavened with it. It is but a slight complication in the usual methods of wine-making.

The especially prepared ferment seems to be very advantageous: it is particularly suitable for multiplying and working in a sulphurous liquid; it is used in priming, being placed in the bottom of a vat before filling. The thorough mixing is then performed by a pump. In order

a regular action of the ferment in the whole mass, the grapes are from the strigs in the case of red wine. This gives finer wines and an economy in the capacity of vats, casks, presses, etc., as well as labour required for the various manipulations.

In order thus to keep fermentation under the best conditions the above operations must be borne in mind. In Algeria the *modus operandi* used by the majority of vine growers varies more or less in details, but everywhere based on the suppression of refrigeration and on the systematic use of sulphurous acid. For some years past the use of sulphuric acid has been quite scientifically applied by the perfecting of BARBET's method of wine-making. By this process an absolutely sterile must can be obtained and set to ferment with selected ferments.

Winification may be retarded at will; in warm countries it may be retarded to the winter months, and this is not the least interesting aspect of the process for Tunis. The possibility of blending musts of different vintages also arises, allowing of the preparation of a single juice of uniform quality for the year.

With the object of obtaining a prolonged state of inactivity in the must, various doses of sulphur dioxide have to be employed, and in these cases even a very active aeration cannot eliminate enough of it to allow fermentation to be set up. BARBET has also solved this difficulty by causing the must to fall through a column of plates in which it is traversed by an ascending column of air. But this method has not received the favour it deserves on account of the price of the apparatus. DEPATY's desulphurizer, which is based on the principle of aeration by warm air, being cheaper is preferred. Good quality products are thus obtained, but their cost price is still high.

At present experiments are being carried out at the Tunis Laboratory, to propose a much simpler solution of the problem, namely of causing partial desulphurization of the must, sufficient to allow a regular fermentation by means of ferments accustomed to sulphurous acid.

Refrigeration in Wine Making. — LABARDE, J., and DELBAYE, J., in *L'Industrie Oenologique*, Year 12, No. 135, pp. 179-191. Paris, June 1914.

In a report on the work carried out by the Oenological Commission for the South West of the "Association Française du Froid", the results of the experiments made, according to a programme of research, on the effect of refrigeration on wines are given.

The subjects to be studied were: 1) The treatment of wines by short rapid refrigeration according to the process usually adopted by the "Société générale aérohydraulique"; 2) Slow and prolonged refrigeration in chambers at different temperatures: about 0° C. and — 3° C. (32° F. and 26.6° F.). The following wines were experimented upon: *red wines*, Chateau Nodot, Anglade du Blayais, Bas Médoc; *white wines*, Les Salles de Castillon.

The above Company's plant for rapid refrigeration consists essentially of two parts: 1) a refrigerating system; 2) some cooled vats. On leaving the refrigerator the wine is sent into vats of the capacity of 1100 gallons, in

which it usually remains a week ; it is then racked and sent to a filter where it is clarified at a temperature which is still fairly low.

In order to estimate the effect of these treatments, the wines were tasted and submitted to chemical analysis.

Considering only the concordant results of the second and third tastings undertaken at a time when the wines had in all likelihood assumed a state of equilibrium, refrigeration applied according to the various methods to red Gironde wines proved favourable three times out of four. As to white wines, in the La Brède wine the improvement was more marked at the second tasting than at the first ; the Castillon wine was improved by the complete treatment by rapid refrigeration, while refrigeration alone did not yield the same results.

The analytical data obtained from the wines experimented upon and collected in tables and they show that rapid cooling determines in general a slight thinning of red wines. Rapid cooling and filtering acts particularly on the flavour of the wines, improving it. Prolonged refrigeration in cold chambers has in general a more pronounced effect than the former treatment. On tasting wines subjected to it they are generally classed higher than all.

The differences observed in tasting were always very slight, and considered by the tasters, who classified the wines with the greatest care as in general only shades.

The object aimed at by the Commission was to know if the use of artificial cold on wines could have the same effect as natural cooling. In some localities this cooling may extend over a fairly long period and with sufficient intensity, without however attaining the freezing of the wine and according to current and very old observations the result is always favourable to the actual and future quality of the wine.

The experiments of the Bordeaux Commission, though limited to a small number of wines, prove that by artificial cooling the principal advantage attributed to natural cooling may be obtained.

The number of white and red wines studied is, no doubt, insufficient to allow of much generalization of results, and if the Commission limits itself to this number, it was because the programme of the experiments contemplated the study of multiple conditions of the application of artificial cold. It has been recognized for the moment that rapid refrigeration has not given very marked results ; on the other hand observations have been clearer as to the prolonged stay of the wine in cold chambers. In the future, investigations must be made with the object of obtaining the maximum effect of low temperature in the shortest time. There is still a whole series of new experiments to be made and the Commission hopes to be able to continue its researches.

946 - A New Method of Making Wine and of Utilizing the Pomace. - *Memoirs in Giornale Vinicolo Italiano*, Year 40, No. 33, pp. 769-772. Casale Monferrato, August 16, 1914.

In view of the fact that within certain limits wine is all the richer in alcohol and perfume the slower the process of fermentation has been,

that some years ago he had prepared a partially fermented and coloured must ("enocyanine krios") to be added to light wines as an object of increasing their alcohol content and colour, Sig. Monti says that by retarding the commencement of fermentation, time is gained, the must to dissolve the colouring matter, the acids, the albuminoids and the other substances contained in the pulp adhering to the pips. His observation, together with the consideration that the only means of obtaining a harmless sterilization is moderate heat, and that in must the advantageous separation of albuminoid and phosphatic matter can take place under 60° C. (140° F.), suggested to the writer a new method of wine making which the director of the *Giornale vinicolo* (E. Ottolenghi) considers a real and important discovery.

The writer proposes to exhaust the fresh pomace systematically by heating it to 55-60° C. (131-140° F.), thus ensuring the complete solution of the sugar, colouring matter, acids and other useful substances contained in it. The result of the operation is a liquid possessing a density only slightly inferior, to that of the must obtained by the first method, and of an intense colour. On cooling, all the argol contained in the pomace separates completely and on concentrating the liquid by concentrating, or *in vacuo* in an apparatus heated by warm water, a juice is obtained containing from 60 to 75 per cent. of sugar. It is so intensely coloured as to require from 10 to 30 volumes of water, according to the quantity of the grapes used, to bring it down to the intensity of colour of the wine. This product, which the writer calls "Estratto integrale" (whole grape extract) keeps absolutely unchanged for years. It can thus be prepared in large quantities in years of plenty and used to correct the wines produced in years of bad or insufficient vintage.

This extract may be prepared from common black grapes or from white varieties, of which it retains the perfume; it is very useful for correcting wines poor in tannin or solids. The addition of this extract to the wine increases the quantity of wine by 10 or 15 per cent., and to a slight extent its alcoholicity, besides imparting to it a more delicate flavour and bouquet. The preparation of this extract allows a fuller utilization of the pomace.

Determination of the Tartaric Acid in Wines by Physico-Chemical Volumetric Analysis. — DUBOUX, MARCEL, in *Annales de Chimie Analytique*, Year 19, No. 3, pp. 89-97. Paris, March 15, 1914.

The processes for determining the total tartaric acid in wines under the form of potassium bitartrate present the following great drawback: the deposition of the crystalline precipitate requires from one to three days and the results are not independent of the method followed. The writer has endeavoured to effect this determination by the method of electroconductivity or physico-chemical volumetric analysis, which allows a rapid and precise determination of the following elements of wine: potassium, lime, magnesia, sulphates, chlorides, phosphates, ammonia, pyruvic acid, alkalinity, etc. The physico-chemical method presents in all cases a decided advantage over volumetric or gravimetric methods, and this has

induced several chemists to adopt it in connection with the usual analytical methods (1).

The study of the determination of tartaric acid in wine by means of conductivity shows that this method is of interest to the chemist who readily analyses wines by physico-chemical volumetry. Knowing the acidity of a wine and its exact content in sulphates, he can by a simple titration which takes only 10 to 15 minutes, determine the total tartaric acid in the wine with a precision equal if not superior to that obtained by the usual method. These results are always rigorously exact in the case of wines of low acidity. They are somewhat less exact when the wines contain an abnormally large quantity of malic acid. If the wine under examination had been treated with citric acid this would be counted as tartaric acid. It would be advisable to determine the tartaric acid by the bitartrate method and the citric acid by difference.

The writer describes the technique of the operations and the reagents employed for precipitation (nitrates of lead, silver, lanthanum and uranium, barium chloride and acetate, caustic baryta). He gives two precipitation curves and the results of the determination of tartaric acid by physico-chemical volumetric analysis in a white wine and in a red one. He then compares in a table the results obtained: 1) by the German official method; 2) by the French official method; 3) by the conductivity method. The figures show that: 1) for wines containing not much acidity, the methods yield results which agree well with each other; 2) with very acid wines the agreement is not so complete; 3) the official French method yields too low values when the wine contains large quantities of sulphuric acid.

948 - Ratio between the Specific Gravity of Cow's Milk and its Percentage of Fat and Dry Matter. — FLEISCHMANN, W., in *Journal für Landwirtschaft*, 1914, Part 2, pp. 159-172. Berlin, 1914.

The writer compares the best known formulae for calculating one of the three quantities (specific gravity, fat content and dry matter) from the other two and concludes that all the formulae, even the most precise, are only approximative and can only by chance in some cases yield results which agree with those obtained by analysis.

Considering, however, the uncertainty of determining analytically the weight of the dry matter in milk, it is preferable to determine it by calculation rather than by direct determination, provided formulae which give the nearest possible approximation be used, and the greatest care be taken in determining fat content and specific gravity.

The formula recommended is the following:

$$t = \frac{4.8 \times f \times d}{4} + 0.25$$

in which t = dry matter

f = fat content

d = degrees of lacto-densimeter.

(1) See article by PAUL DUTOIT and MARCEL DUBOIX: "Analysis of Wine by Physico-chemical Volumetric Method." — *B. Dec.* 1912, pp. 2562-2569. (E)

the results obtained by this formula agree very nearly with those by Fleischmann's well-known formula.

An Investigation into the Composition of Cheese made from Whole Milk. — WINKLER, G., in *Department of Agriculture and Technical Instruction for Ireland, Annual*, Vol. XIV, No. 3, pp. 499-506. Dublin, April 1914.

Cheese, properly so-called, ought to be made from whole milk, and contain as nearly as possible all the fat in the milk from which it is made. Hitherto it has not been easy to condemn cheeses made from full or half-skimmed milk, as there is no standard defining what percentage of fat a whole-milk cheese should contain. To obtain comparative figures suitable for the fixing of a minimum fat content, it is necessary to eliminate the factor water, which varies considerably, even among cheeses of the same type.

In order to determine what would be a reasonable figure for this standard, the Department of Agriculture and Technical Instruction for Ireland arranged for analyses of Caerphilly and Cheddar cheeses, representing semi-soft and hard cheeses respectively, to be carried out from October 1911 to 1913 by the Albert Agricultural College, Glasnevin, and the Royal College of Science, Dublin. In each case the test was made with: 1) a sample of whole milk before manufacture; 2) a sample of the "green" cheese, and 3) a sample of the "cured" cheese.

The results showed that the percentage of fat in the dry matter never fell below 47. In the case of Cheddar cheeses the maximum and minimum percentages were respectively 53.54 and 48.72 in the green, and 52.96 and 48.60 in the cured. In the case of Caerphilly cheeses the corresponding figures were respectively 47.75 for the green and 57.15 and 47.11 for the cured cheese. The average percentage of fat in the dry matter of all the green cheeses is 51.49, and of the cured cheeses 51.19. The general average for all samples (327) is 51.33. Thus 45 per cent. can be fixed as the limit below which the percentage of fat in the dry matter of a genuine cheese should not fall.

Accidentally, the collected results also show that 1 gallon of milk will yield:

- 1.300 lb. of green Caerphilly cheese.
- 1.239 lb. of cured Caerphilly cheese.
- 1.056 lb. of green Cheddar cheese.
- 1.000 lb. of cured Cheddar cheese.

On the Characteristic Flavour of Roquefort Cheese. — CURRIE, J. N. (Chemist, Dairy Division, Bureau of Animal Industry, U. S. Department of Agriculture) in *Journal of Agricultural Research*, Vol. II, No. 1, pp. 1-14. Washington, April 1914. These researches were initiated to identify the substances which impart the characteristic Roquefort flavour and to account for their presence. In giving a résumé of the preceding work on this subject, the writer describes his experiments as follows:

- 1) The experimental method adopted was that employed by JENSEN.
- 2) *Volatile acids.* — The soluble acids present were essentially a mixture of volatile fatty acids of milk, viz. acetic, butyric, capric, caprylic, caproic. The insoluble constituent contained chiefly capric acid. They may be pre-

sent as free acid or in a feeble state of combination without losing their characteristic flavours. A ripe Roquefort cheese gives a distillation number (*i. e.* the number of cc. of decinormal alkaline solution necessary to neutralize 100 cc. of the distillate) between 30 and 60, whilst a slow-ripening cheese of poor flavour gives a distillation index less than 30, and a quick-maturing cheese of highly developed flavour will have an index above 60, in extreme cases even exceeding 100.

3) *Relation between volatile acids and flavour.* — The writer is of opinion that the cheese owes its piquant flavour to the accumulation of volatile acids (caproic, caprylic and capric) and their easily hydrolysable salts. These acids generally occur free, or in such feeble combination that their flavour is masked.

4) *Origin of the volatile acids.* — Since these acids comprise those in the fatty matter of milk, from lauric to butyric, and in almost the same proportions, the writer believes these acids are derived from the hydrolysis of the fatty matter of the cheese. The small quantities of acetic and possibly formic acid can be accounted for by the fermentation of carbohydrates in the early period of maturation or by the partial oxidation of higher alcohols or of glycerine during the ripening period.

5) *Culture experiments with *Penicillium Roqueforti*.* — Cultures were made in Czapek's solution and by inoculation of sterilized coagulum. In the former case about two-thirds and in the latter about one-half of the fatty matter was hydrolysed without an appreciable accumulation of soluble and volatile acids. In the natural cheese, however, these products accumulate, probably on account of the limited supply of oxygen preventing the complete oxidation of the butyric and caproic acids, or more probably because of slow maturation, especially in the interior part of the cheese where ripening is more complete, soluble enzymes such as lipase are present.

6) *Enzymes.* — A lipase was extracted from the mycelium of *Penicillium Roqueforti*. It was also shown that the ripening process is promoted by an enzyme capable of hydrolysing simple esters as well as glycerides.

The writer concludes that :

1. During the ripening of Roquefort cheese a considerable quantity of fatty matter is hydrolysed.

2. *Penicillium Roqueforti* produces a lipase soluble in water, which is responsible for the hydrolysis.

3. The hydrolysis causes an accumulation of free or combined volatile acids.

4. The piquant flavour of Roquefort cheese is due to caproic, caprylic and capric acids and their easily hydrolysable salts.

A bibliography of 16 works is appended.

PLANT DISEASES

DISEASES NOT DUE TO PARASITES AND OF UNKNOWN ORIGIN.

Withering of the Panicle in Rice. — POLI, POLO, in *Il Giornale di Riscoltura*, t. IV, No. 14, pp. 206-209, 2 figs. Vercelli, July 30 1914.

The phenomenon described as "colatura" consists in a special abortion of the flowers of the apical spikelets of the panicle, which become reduced to thin filaments more or less shrivelled and twisted, forming a tuft which disappears before the grain is ripe. This results in a diminution of the yield.

Certain varieties of rice, in particular Italian varieties and those grown long time in Italy and thus more susceptible, are more frequently attacked by this disease than the hardier and more resistent Japanese varieties. For example, the varieties Ostiglia, Ranghini, Nero di Vialone, and others are conspicuously attacked, whilst Originario is less so.

This disease must not be confused with a very similar phenomenon produced by hail at certain times and in certain conditions of the growth of the plant, namely, when the stem is already swollen and the panicle on the point of emerging from its sheath. Then, if a large hailstone strikes the leaf near the base, it bends back and breaks, thus forming an obstacle to the opening of the sheath, and preventing the regular development of the panicle. This results in a lateral opening and remains caught with the apical grains in the sheath, unable to grow up straight and thereby becoming sterile.

As the result of researches carried out in different seasons, the writer considers the disease is generally due to the coexistence of two principal causes, namely, excessive fertility, and a period of intense cold at the time corresponding to the last phase in the formation of the flowers, when the panicle is still enclosed within the sheath.

BACTERIAL AND FUNGOID DISEASES.

- 952 - **The Status of Investigational Work on Pear and Apple Blight.** — **SALMON** DEANE B., in *Montana Agricultural College Experiment Station, Circular 39*, pp. 13. Bozeman, Montana, 1914.

Pear and apple blight is a serious disease which has been observed in the United States (Hudson River Valley) since 1792. J. T. Burrill in 1878 discovered the cause of the disease to be a bacterium called *Bacillus amylovorus*. In 1889 M. B. Waite, of the U. S. Department of Agriculture, observed that some insects convey the bacterium from the partially dead bark border on that which is still healthy to the flowers when these begin to open in spring and thus assist greatly in spreading the disease. Of late years the disease has been studied by several American Experiment Stations from all points of view, as well as the different susceptibility to it of the different kinds of pears and apples, the influence of climate and soil on its virulence and effects of the most varied fungicides and insecticides. These researches are being actively continued. The Circular invites practical farmers to be faithful in the experimental investigations of phytopathologists and not allow themselves to be taken in by the vendors of specific remedies consisting of chemicals to be spread on the soil or injected into the trunks of the trees as the efficacy of such remedies has not been borne out by any rigorous conducted scientific experiment.

- 953 - **Observations on the Life-History of the American Gooseberry-Mildew (*Sphaerotheca mors-uvae*).** — **SALMON**, E. S., in *The Annals of Applied Biology*, Vol. I, No. 2, pp. 177-182. Cambridge, 1914.

Sphaerotheca mors-uvae (Schwein.) Berk et Curt. differs from other introduced Erysiphaceae in producing abundance of perithecia under normal conditions in Europe. Many of these remain in the patches of mycelium on the shoots until the following spring. According to English legislation fruit growers who do not remove these shoots during the winter are liable to prosecution. The writer suggests the possibility that perithecia formed during the summer attain maturity; such perithecia germinate easily in contact with a drop of water. On reaching maturity they usually fall to the ground; the perithecia formed later do not hibernize but always perish, as well as the patches of mycelium, and consequently cannot become sources of infection. It may therefore be necessary to modify the Regulations on compulsory control. It remains now to ascertain how the spring infection takes place. It does not appear that it is always due to the ascospores coming from the ground, because in some cases observed by the writer the first berries infected were the high ones, probably many mature perithecia in falling, especially during autumn pruning, get caught in the crevices of the bark or between the bud-scales and there germinate in spring.

Burgundy Mixture. — FONZES-DIACON, in *Le Progrès agricole et viticole* (Édition de l'Est-Centre), Year 35, No. 29, pp. 70-80. Montpellier, 1914.

In this communication presented to the International Congress of Viti-
culture at Lyons in July 1914, the writer gives an account of his laboratory
experiments on the composition of neutral, acid and alkaline Burgundy mix-
tures.

The superiority of acid sprays (*i.e.* all mixtures containing an excess
of copper sulphate), as confirmed by the writer, appears to be due not only
to the excess of free copper which they contain, but also to the presence,
in solution as well as in the precipitate, of the basic sulphate ($\text{CuSO}_4 \cdot 3\text{CuO}$,
 H_2O) which is insoluble in pure water but very soluble in presence of dis-
solved carbon dioxide.

It is also to the presence of this basic sulphate that the mixture owes
its property of keeping.

Wetting Burgundy mixtures should belong to the acid type, since al-
kaline mixtures (*i.e.* those containing an excess of free sodium carbonate)
contain only a little or none at all, of this basic sulphate in their precipi-
tate, and have none in solution.

In the preparation of these acid sprays, the dilute solution of sodium
carbonate should be slowly added to the concentrated copper sulphate so-
lution which is stirred constantly.

To obtain an acid spray containing about 200 to 500 gms. of free copper
sulphate per hectolitre, about 350 to 500 gms. of 90 per cent. sodium carbo-
nate should be added for each kilo of copper sulphate. The copper sulphate
dissolved in 10 to 15 litres of water and the sodium carbonate in the remain-
ing 85 or 90 l.

A New *Botrytis* on Flowers of Red Clover in Russia. — BONDARTSEFF, A. S.,
Kurnal Boliesni Rastenii (Journal of Plant Diseases), Year VIII, No. 1, pp. 1-25,
p. 1-3, plates I-IV (abstract in German). Petrograd, 1914.

The writer has found the flowers of red clover (*Trifolium pratense*)
in Russia attacked by a new species of *Botrytis*, which he describes as *B.*
trifolii.

The mycelium of the parasite penetrates into all parts of the plant, but
is most prominent in the intercellular spaces; it develops its conidia on the
walls. The disease is spread by means of the seed and the writer has ob-
served the mycelium below the seed coat of seeds produced from arti-
ficially infected flowers, as well as in those of naturally diseased plants.
The presence of the fungus appears to have no effect on the cut of clover.
The damage only concerns the anthers and consists in a loss of germinative
power of the pollen grains, which appear very deformed under the micro-
scope.

The writer points out that the diseased plants produce a smaller
quantity of seed than healthy plants, but the germinating capacity of the
seed produced is higher, being about 63 per cent., whilst that of seeds from
healthy plants does not exceed 43 per cent.

In every case the seeds harvested from diseased plants are smaller,
pale and less heavy than normal seeds.

The writer considers that seed-testing stations should carry their investi-

gations to the testing of the degree of infection of clover seeds with this fungus, as is already done in the case of cereals infected by smut, *Fusarium*, etc.

In 1913, *B. anthophila* was found in the following provinces: Petrograd, Tula, Kursk, Voronezh, Pskov, Novgorod and Ufa. This would lead one to suppose that the fungus is widely spread and that in case of a bad crop of clover seed the damage is often attributable to this disease alone.

The diseased flowers can sometimes be recognized by their pale violet colour, though flowers with this appearance are not necessarily infected. The disease can easily be recognized by opening the flowers and removing the anthers, which when normal are yellow in colour but when attacked by the disease the conidia of the parasite give them a greyish appearance.

956 — **Potato Diseases in Great Britain.** — HORNE, A. S., in *The Annals of Applied Biology*, Vol. 1, No. 2, pp. 183-203, figs 1-8. Cambridge, 1914.

This paper is a critical review of the principal potato diseases which are at present of importance in Great Britain and also of the steps that should be taken to know them better and to control them efficiently. Some of these diseases are treated at length: wart disease or tumour (*Synchytrium endobioticum*), potato disease, late blight or murrain (*Phytophthora infestans*); "sprain", a disease of the tubers, the origin of which is still obscure and which includes two forms: "blotch" (internal disease) and "streak" (sprain); *Fusarium* disease, under which two types of disease are recognized: *Fusarium* wilt caused by *F. oxysporium*, one of the most serious diseases of the potato in the United States, which does not seem to have appeared in Europe, and the dry-rot disease which appears to be caused by one or more species of *Fusarium* including *F. Solani*, of rare occurrence in Great Britain; leaf-curl (German "Blattrollkrankheit"), according to the writer not due to parasites; and lastly canker or powdery (*Spongospora Solani*).

957 — **Celery Leaf-Spot Disease (*Septoria Petroselinii* var. *Apii*) in England.** — CHITTENDEN, F. J., in *The Annals of Applied Biology*, Vol. 1, No. 2, pp. 203-214. Cambridge, 1914.

The seed of celery (*Apium graveolens*) is the chief, if not the only, carrier of the disease caused by *Septoria Petroselinii* Desm. var. *Apii* Cav. The seedlings as soon as they emerge from the ground already have the fruits of the fungus on the cotyledons and on the plumule; the disease then remains localized on each plant and does not pass from one to another.

Samples of "seed" — the commercial term for the whole or the fruits (mericarps) of celery, mixed with other parts of the plant — which were examined by the writer were found to contain 90 per cent infected seeds; consequently it will be advisable to see to the disinfecting the seed and to its collection only from healthy plants.

(1) See also No. 3242, B. Nov.-Dec. 1911.

- **Black Rot of Grapes (*Guignardia Bidwellii*) in Spain.** — RAVAZ, L., in *Progrès agricole et viticole*, Year 31, No. 30, pp. 114-115. Montpellier, 1914.

France was formerly the only country in Europe in which the black-fungus (*Guignardia Bidwellii* Viala et Ravaz) was known; this fungus now been reported in Spain. It has not of late years caused as much damage as formerly, probably owing to the absence of the sclerotial stage. Leaves and grapes showing the distinctive characters of the disease have been received from the province of Valentia. The fruits were not entirely destroyed by the disease, thus showing the serious importance of the outbreak.

- **A Contribution to our Knowledge of Apple Scab.** — MORRIS, H. E., in *Montana Agricultural College Experiment Station, Bulletin*, No. 96, pp. 69-102, 1 plate + 3 figs. Bozeman, Montana, 1914.

In the State of Montana, apple scab (*Venturia inaequalis*, conidial form *Asciadium dendriticum*), so common a disease in all portions of the civilized world where the apple is grown, appeared first on the east side of the Great Lake about 1900 and spread slowly all round.

During the summers of the last three years climatic conditions were favorable for the development of apple scab and the occurrence of twig infection was not at all infrequent, especially on the McIntosh variety. The shoots the spots caused by the disease are similar to those occurring upon the fruits, except that they are minute, being scarcely visible to the naked eye though readily seen under a low magnification. Living cultures were obtained from some of these spots during the month of March, no data were secured as to the extent to which such twigs are a source of twig infection.

The primary spring infection period in the State of Montana corresponds to that observed by Wallace, according to whom the spring infection occurs at the time the ascospores mature, if weather conditions at that time are favorable; but during the cool damp seasons of 1911 and 1912 late summer or secondary infection occurred. This took place about the middle of August or beginning of September and at harvest time many of the scab spots were visible on the fruit, which might have been prevented by late spraying.

The observations of the writer, covering a period of several years, confirm the opinion of Wallace that *V. inaequalis* is a species entirely distinct from *V. pirina* (pear scab). He has seen scab abundant on apple trees while Flemish pear trees in the same orchard were not attacked; Flemish pear is generally conceded to be very susceptible to scab. In older sections, where both diseases have been prevalent for years, this distinction could not be observed.

The injury and corresponding loss to the apple crop due to the presence of scab is far greater than is generally believed; nevertheless it is difficult to value in money the total loss due to the disease. A conservative estimate of the loss due to scab in the Bitter Root Valley during 1911 and 1912 would be 15 per cent. of the entire crop. This loss is due to the reduction in price or to total destruction of the fruit by the fungus.

As there are early blooming varieties of apples and late blooming ones, their proper distribution is important in the control of the disease. When the varieties are badly mixed in rows it is commercially impracticable to spray at the proper time; the difference in time between the blooming of the different varieties necessitates extra sprayings. For this reason it is desirable to set the trees in separate blocks. For equally susceptible varieties which blossom about the same time this would not be so important but it is never advisable to mix susceptible and resistant varieties. It is well known that there are great differences among the varieties of apples grown in Montana with respect to their susceptibility to scab. The selection and improvement of scab-resistant varieties may be one of the effective methods of dealing with the problem. No variety of apple is immune from scab under the most favourable conditions for the development of the fungus, and it is also recognized that varietal susceptibility may vary in different localities. The opinion of several authors that certain varieties may be resistant in one year and susceptible in another year under conditions which for average varieties are as favourable to the disease as one case as in the other, apparently does not apply to Montana. The writer gives a table in which the 44 varieties of apples commonly grown in the western part of the State are divided into 4 classes (practically resistant, moderately resistant, moderately susceptible, susceptible). The result of observations covering a period of five years, three of which were favourable for the development of the apple scab fungus.

The practically resistant varieties are: Hubbardston, Olden (Duchess), Wagener, Wealthy, and York Imperial.

The two fungicides which have been used to a considerable extent in the State are lime-sulphur and Bordeaux mixture; lime-sulphur is the more important and is used generally at a strength which approximates that recommended by Scott (4 lbs. of sulphur in solution to 50 gallons of diluted spray). Bordeaux mixture, owing to the russetting of fruit and burning of the foliage, has been almost entirely replaced by lime-sulphur.

For controlling scab on susceptible varieties — classes 3 and 4 — applications should be given at specified times; for the fairly resistant varieties — classes 1 and 2 — two sprayings should be given, namely one when the flower buds show a pink colour and the other when most of the petals have fallen; according to weather conditions one later spraying sometimes be advisable.

According to experiments carried out in Montana on 1200 six-year-old trees, the cost of spraying once with lime-sulphur is 2 cents (10¢) per acre.

The writer has cultivated the conidial form (*Fusicladium dendriticum*) of *V. inaequalis* in several artificial media with varying success.

The paper concludes with a bibliography referring to 505 works on the subject.

Rotting of Pomegranates in India: *Sterigmatocystis castanea*. — BOWEN, E. J., in *The Agricultural Journal of India*, Vol. IX, Part II, pp. 205-206. Calcutta-London, 1914.

Specimens of pomegranates were recently received from a garden at Bombay, which, though of excellent external appearance, were blackened and rotting inside. The rot was found to be due to a fungus, *Sterigmatocystis castanea* Patterson, and the disease to be identical with one described in 1912 as a new and serious disease of this fruit in America, which it had been first observed in the United States in 1910.

In the more advanced stages of the disease there are cavities inside the fruit filled with a brown powdery substance, composed of the spores of the fungus.

It is suggested in the United States that the fungus gains an entry when the calyx is open; subsequently the calyx closes and the parasite develops within the growing fruit. If this be the case it is hard to see how the disease can be checked. But there is another possibility: several cases are known where fruit which is externally sound is mouldy inside, and in these cases the mould is frequently some common species, whose spores are likely to be present in the air in considerable quantity. Walnuts are, perhaps, the most familiar example of this condition. Tea is also not infrequently affected in a similar manner, and very probably the mould gains an entry through punctures in the young fruit caused by a sucking insect. It is possible that the pomegranate rot is due to a similar cause, and if so, the question of its prevention resolves itself into the question of preserving the young fruit from such insect attacks. The writer proposes, with the co-operation of fruit growers, to ascertain whether this hypothesis has any foundation in fact.

1. **The Bud-Rot (*Pythium palmivorum*) of Coconut Palms in Malabar (1).** — SHAW, F. J. F., and SUNDERARAMAN, S., in *The Agricultural Journal of India*, Vol. IX, Part II, pp. 111-117, plates LX-XI. Calcutta-London, 1914.

In October 1912 the first report of a serious disease of coconuts in Malabar began to attract attention. The first outbreak noticed was at Tamarasseri; for several miles round this village, cases of the death of the coconut trees in different gardens were common. In February 1913 neighbouring localities of Kidavur, Pallipuram, Karothiur, Vavada, Kuttur, and Puthuppadi were inspected and a number of adult plants and some cases also young seedlings which had been transplanted only a year before, were found to be more or less diseased. Enquiries made in the locality seemed to show that the disease was of about ten years' standing, and it has spread so slowly that it had not alarmed the growers.

The true cause of the disease was not identified when the first inspection was made, the weather at the time being hot and dry, and it was decided to make further investigations during the rainy season.

For this purpose, Tamarasseri was visited about the end of July at the height of the monsoon, when the nature of the disease at once became

(1) See also *B. Dec.* 1910, pp. 368-370.

(Ed.).

apparent from a study of young trees in an early stage of infection. The first symptom by which a diseased tree may be recognized is that the central leaf turns brown, collapses and dies. As everyone knows, the youngest central leaf of a coconut is folded up like a fan. If now the dead central leaf be removed and unfolded, it will be found that at the point where the leaf has collapsed the folded lamina is covered with a white fluffy growth of fungus. This fungus, starting at one point of the leaf, eats its way straight through the folds of the lamina and produces a softening of the tissues leading to the collapse of the leaf at this point as a result of this the portion of the leaf above the point of infection turns brown and dies. In cases in which the infection is very recent and the whole leaf has not had time to turn brown, the area infected by the fungus gives rise to very characteristic rows of spots. If, as sometimes happens, the attack does not spread beyond this point, then when the central leaf expands, a row of brown spots in which the leaf tissue has decayed can be seen stretching across the leaf.

In material from recently infected leaves it was possible to make a very complete examination of the morphology of the fungus, which is no doubt that it was to be identified with *Pythium palmivorum* as the cause of the bud-rot of palmyras (*Borassus flabellifer*).

On leaf spots, the white fluffy mycelium of the fungus bears abundant sporangia, which under appropriate conditions of moisture discharge their spores. In the case, therefore, of a tree in which the central leaf is attacked it is easy to see how the infection spreads. A single day's rain would be sufficient to wash the spores down from the central leaf into the interstices of the bases of the older leaves, where the fungus would find the most favourable conditions for development. In this way, and sometimes doubtless by infection from other trees, the fungus forms rot spots on the leaf bases, which vary in size; they are of a dark brown colour and present a fibrous appearance.

Once the fungus has become established in spots on the leaf bases the death of the palm is a mere matter of time. The mycelium eats its way in, passing from one leaf-base to another, and finally reaches the growing point and kills the tree. As this goes on, the older leaves gradually droop and fall off, while the spread of the rot is accelerated by various saprophytic fungi, bacteria and insects. In the final stage of the disease the tree is left as a bare pole with, possibly, a single discoloured leaf drooping from the crown. In the later stages of the disease when the older leaves are falling, it is not easy to identify the fungus; the apex of the tree is then a semi-liquid putrescent mass in which saprophytic organisms are extremely abundant. In the early stages of an infection it might be possible to confuse a case of tree bud-rot with an attack by *Rhinoceros* leaf-rot (*Oryctes rhinoceros*). However, in those cases of bud-rot in which the infection is recent and the whole of the central shoot is not involved, the rows of spots on the folded lamina constitute a reliable criterion of distinction.

From a consideration of the habit of *P. palmivorum* it is not difficult to see how such a disease would spread once it was established in any locality. On a windy wet day drops of water containing spores may be blown from one tree to another, while the practice of climbing for leaf cutting and tapping for toddy would also favour the dissemination of the fungus.

The writers obtained the parasite in pure cultures and were successful in carrying out new infections with them.

At the same time at which this disease was diagnosed at Tamarasseri in neighbouring localities, it was also identified in other parts of Malabar (Chappuram, Melmuri, Calicut, Kurmathur, Andoor, Koyyam, etc.).

At present the disease appears to be scattered throughout Malabar, but fortunately nowhere with the virulence seen in palmyra palms in certain localities of the Godavari district.

In both the palmyra and coconut palms it is difficult to recognize the symptoms of disease in an early stage. This fact, coupled with the difficulty in applying any treatment to palm trees, renders the destruction of affected trees the surest method of controlling the disease. As has been the case in the Godavari district, the local authorities are taking active steps for the destruction of the affected trees in the various districts of Malabar, and, more fortunately than in Godavari, it has been possible to diagnose the disease in its initial stage. Since the beginning of operations 352 diseased trees have been identified and of these 150 have already been destroyed.

Among the factors influencing the spread of the disease, that most favourable to the growth of the fungus is the degree of moisture.

- Wood-destroying Fungi which Grow on Both Coniferous and Deciduous Trees in the United States of America and in Europe. — WEIR, JAMES R., in *Phytopathology*, Vol. 4, No. 4, pp. 271-276. Baltimore, Md., 1914.

In the course of investigations on the fungi attacking forest trees in the North-West States, the writer found many new and exceptional hosts for certain fungus species heretofore supposed to be strictly confined to coniferous or deciduous trees. In connection with the facts discovered, there is one which must not be overlooked in the correct determination of similar species growing under a great range of conditions, namely the great variation induced in some characters of their sporophores.

The following is a first list of fungi and their new or exceptional hosts.

Hydnum coralloides Scop. (?), abundant on the wood of deciduous trees, especially on *Populus*, has been found in the forests of Idaho and Washington on *Abies grandis* and occasionally on *Picea Engelmanni*.

Stereum hirsutum Willd., frequent in the West on various hardwoods, has been found occasionally on conifers, usually on branches of *Abies grandis* and *Tsuga heterophylla*.

S. purpureum Pers., which usually grows on *Populus*, *Salix* and *Betula*, has been collected on moist branches of *Larix occidentalis*.

Hymenochaete tabacina Sid. is common on both conifers and broad-leaved trees in the North-West.

Trametes Pini (Brot.) Fr., apparently never reported as growing on deciduous wood, has been collected on *Betula occidentalis* in Idaho.

T. picienus Pk. on *Crataegus* sp. in the West.

T. suaveolens L., common throughout the West on *Populus* and *lix*, has been found on *Abies grandis*.

Polyporus giganteus (Pers.), described by Murrill as growing on deciduous trees, has been found on conifers in Idaho, more often in connection with old decayed roots of Douglas fir, and on *Pinus sylvestris*.

P. frondosus Fr., known on the roots of Italian chestnuts, and *P. bellatus* (Pers.), have been frequently observed on conifers in Idaho and Washington.

P. Berkeleyi Fr., found in the East at the base of oaks, has been collected on *Larix occidentalis* in Idaho.

P. picipes Fr., common on *Populus* in Idaho and Washington, been collected on *Picea Engelmanni* and *Abies grandis*.

P. chioneus Fr., usually found on wood of deciduous trees, is common on conifers in the North-West, principally on *Thuja plicata*; it has also been found on *Pinus monticola* and *Tsuga heterophylla*.

P. adustus Fr., common on *Betula occidentalis* and on species of *populus*, is occasionally found on *Larix occidentalis*, *Thuja plicata* and *Tsuga taxifolia*, though very rarely.

P. dichrous Fr., associated in the East with *Quercus alba*, is common on *Juniperus virginiana* in the vicinity of Washington, D. C., and has recently been found to be a serious sapwood fungus on various North-Western conifers (*Thuja plicata*, *Tsuga heterophylla*, *Pinus monticola* and *Larix occidentalis*).

P. sulphureus Fr., common in Europe on both coniferous and broad-leaved trees, attacks practically every native forest tree in America.

P. caesius Fr., which ordinarily occurs in the East on the wood of deciduous trees, is common in Idaho and Washington on *Tsuga heterophylla*, *Larix occidentalis* and *Abies grandis*.

P. benzoinus (Wahlenb.), common in Idaho and Washington on *Tsuga heterophylla*, *Larix occidentalis* and *Abies grandis*, is undoubtedly the same as *P. resinusus* Schrad., on species of *Populus* and *Acer* in the Eastern States.

P. gilvus Fr., thought to be confined to the wood of deciduous trees, is quite common on *Juniperus virginiana* in the vicinity of Washington, D. C.

Polystictus aurantiacus Pk., considered a very rare fungus in the United States, is principally associated with *Pseudotsuga taxifolia* and *Tsuga heterophylla* in Idaho and Washington; the writer has recently collected it from a maple in Idaho.

P. versicolor (L.) Fr., well known on many deciduous trees, has been collected on *Larix occidentalis*, *Pinus monticola* and *Pseudotsuga taxifolia*.

P. cinnabarinus (Jacq.) Fr., occurring abundantly in the North-

Betula occidentalis, *Acer glabrum*, *Populus*, *Prunus* and *Salix*, has rarely been collected on *Thuja plicata*.

P. hirsutus Fr., one of the most common of all polypores on the wood of deciduous trees, has been collected on *Thuja plicata*.

Fomes pinicola, besides occurring on practically every conifer in the North-West, has been found on *Populus trichocarpa*, *P. tremuloides*, *Betula occidentalis*, *Salix lasiandra*, *Alnus tenuifolia*, *Pyrus* and *Malus* and a variety of plums; the writer has collected it on *Fagus sylvatica* and *Quercus imbricata* in Baden, Germany, where it also occurs on *Alnus glutinosa*; Hinton reports it upon *Fagus ferruginea*, *Betula lenta* and *Acer saccharinum* in the Adirondacks, on the balsam poplars of Northern Michigan and on *Prunus serotina*.

F. annosus Fr., which usually attacks conifers, has been collected on some deciduous trees of the North-West.

F. leucophaeus Mont., frequently found on coniferous hosts in the West, is more often associated with deciduous hosts, especially *Populus*.

Lenzites sepiaria Fr., so common on coniferous wood, is frequently found on deciduous trees, among which Spaulding mentions *Alnus* sp., *Salix alba*, *P. deltoides*, *P. tremuloides*, *Salix* sp. and *S. discolor*; the fungus has been collected in the North-West on *Alnus tenuifolia*, *Prunus pennsylvanica*, *Betula occidentalis*, *Populus trichocarpa*, *Salix lasiandra*, *Acer rubrum* and *Crataegus Douglasii*; all are very rare hosts, especially the last. *Armillaria mellea* (Vahl.) Quél., is common on both coniferous and broad-leafed trees.

Pleurotus serotinus Fr., common on *Alnus* and *Populus*, frequently occurs on *Abies grandis*.

Pholiota adiposa Fr., a serious enemy of *Abies grandis*, occurs also, though rarely, on *Populus*.

Paxillus atrotomentosus Fr., common on coniferous wood, is more rarely found on the wood of broad-leaf species.

PARASITIC AND OTHER INJURIOUS FLOWERING PLANTS.

- *Papaver Rhoeas* and *P. hybridum*, Common Weeds in Egypt. (1) — BOLLAND, B. G. C., in *The Agricultural Journal of Egypt*, Vol. IV, Part I, pp. 53-54, plate II. Cairo, 1914.

After recalling the general characters of the genus *Papaver*, the writer gives a systematic description of the two commonest species occurring as weeds in Egypt: *P. Rhoeas* and *P. hybridum*.

The former, known in Arabic as "Zaghliil" and "Qarun", flowers in winter and spring and is found in waste places and barley fields along the Mediterranean coast.

P. hybridum, in Arabic "Abu el Nôm", flowers in the spring and is found chiefly in the barley fields of the Mariut district.

(1) See also No. 390, B. April 1914.

This species was noticed by Forkal in his "Flora Aegyptiaco-Arabi" as growing in Egypt in 1775. The word *Papaver* is also mentioned by Prosper Alpinus in his book "De Plantis Aegypti" written in 1644 but no species is given.

INSECT PESTS.

964 - Notes on the Biology of Leather Jackets (*Tipula oleracea*) in the Pastures of the Avesnois (Nord, France). — Désoul, P. in *Comptes rendus hebdomadaires des séances de la Société de Biologie*, Vol. LXXVII, No. 21, pp. 126-127. Paris, 1914.

During this year (1914) leather jackets have caused serious damage to the pastures about Avesne (Cantons of Bavay and Le Quesnoy). Farmers in this region noticed scattered throughout their fields numerous circular patches of dead yellow grass which did not resume its normal vegetative growth in April. On digging up these dried patches of turf they were found to be swarming with these grubs, especially at a level with the origin of the roots, the majority with their heads at level with the surface of the soil, others at a depth of from 4 to 5 in. but within the root range of the grasses.

Grasses and clovers are particularly attacked by these larvae on plants with larger and tougher roots, such as couch, dock, plantain, etc. Leguminosites, are free from attack. The larvae in the soil bordering on a turf often fall down and being unable to climb out they become buried in several layers deep. They do not migrate from one plant to another but feed almost entirely on the plant near which their eggs were deposited. After the death of the plant they feed on its dead tissues and decayed humus. They are most injurious during their growing period (October to May), especially to plants which live through the winter. This explains why pasture plants are particularly attacked.

Spring-sown crops are therefore less exposed to attack since they do not possess a well-developed root system until May or June when the larvae are entering on the nymph stage.

According to the writer the only practical means of control is to destroy the larvae by deep cultivation at the end of winter and to sow a new crop in March or April. Spring-sown oats and wheat have grown without damage on infested land treated in this way.

965 - Observations and Researches on the Life History of the Beet *Aphis euonymi* (2). — MALAQUIN, A., and MOITÉ, E. A., in *Comptes rendus hebdomadaires des séances de l'Académie des Sciences*, 1914, First Half-year, Vol. 158, No. 19, pp. 1374. Paris, 1914.

In 1913, M. Gaumont recorded deposits of eggs of sexual females of *Aphis euonymi* Fb. on beets, so that according to him this species is at

(1) According to P. A. SACCARDO: *Cronologia della Flora italiana*, p. XIII, 1909, the above mentioned work by Alpino (1553-1617) was published at Padova in 1617.

(2) See also No. 296, B. March 1914.

lete its life cycle on herbaceous plants. In October 1913 a large number of colonies of this aphid were found on beans and comprised winged and wingless females; the latter deposited large numbers of eggs on the stems and leaf-stalks. The observations, accompanied by experiments, were carried on to the spring of 1914.

It was found that eggs deposited by sexual females on beans (intermediate host) in the autumn did not hatch, whilst eggs deposited on the principal host, *Euonymus europaeus*, hatched out normally. Further, the larvae from these eggs were placed on beet leaves, they refused to suck them.

It appears therefore that in the case of a migratory species such as *myrmica*, the generation produced from the fertilised eggs is adapted only to the conditions of its principal host, and the adaptation to different (intermediate hosts) appears in later generations.

The Emergence from the Soil of the First Larvae of *Phylloxera vastatrix* in Italy. — G. ASSI, B., in *Rendiconti delle sedute della Reale Accademia dei Lincei, Classe di Scienze fisiche, matematiche e naturali*, 2nd Half-year, Vol. XXIII, art. 2, pp. 19-30. Rome, 1914.

Researches carried out in North, Central and South Italy show that the emergence of the first larvae from the soil before they commence to feed is a normal phenomenon of more general occurrence than was believed by Reaumur, who first observed it (1868), and the other authorities who have followed him. A close examination with the naked eye or a hand lens of the soil close to diseased stocks is sufficient to reveal their presence.

The emergence of the larvae is more or less abundant throughout the year except during the hibernation and the period preceding the birth of the first daughter generation of the hibernating females. In Southern Italy they do not appear so frequently from the second half of July to the end of August, the period corresponding with the partial aestivation of the insect.

Considering such a powerful means of distribution of the insect as the first larvae, it is reasonable to suspect that the passing of workmen from vine to vine in the vineyards is a source of danger. This fact should be taken into account before adopting measures for controlling the disease, when the principal centre of infection has been discovered and especially when there is reason to believe that the whole vineyard has become infected. Researches are being conducted to determine the influence of tillage, the presence or absence of superficial roots, of root development, etc., on the numbers of these first larvae which emerge from the soil. It has already been determined that winter digging is a most effective means of propagating phylloxera over both small and large distances.

It is also affirmed that it is dangerous to examine for phylloxera during windy weather, since a slight wind suffices to carry the larvae from the diseased roots. The necessary precautions to prevent these dangers are often neglected by the workmen.

967 - Notes on *Aspidiotus bromellae*. — LINDINGER, LEONHARD, and GREEN, in *The Journal of Economic Biology*, Vol. 9, No. 2, pp. 73-75. London, 1914.

Contrary to the opinion of Green (1), Linderger affirms that *Aspidiotus bromellae* is indigenous to the Azores and not the Canaries. He also adds that as this scale attacks only Bromeliaceae, its original country should be sought in America where these plants (including the pineapple) are indigenous. He also disagrees with Green that this insect may become a serious pest of the pineapple, as its development is too slow.

Green replies that our knowledge of this species is too incomplete to make definite conclusions, since it is not yet known if it is confined to the Bromeliaceae. Further, the Bromeliaceae are indigenous not only to America but also to India, Ceylon, Java and other eastern countries. As to the danger of these scales, Green mentions that the pineapple market from the Seychelles was so badly infested that the health of the plant must have been seriously affected. The rapidity of development of the insects depends so much on the presence or absence of their natural enemies (Coccinellids and Hymenopterous insects) that conclusions based on conditions prevailing in one region may be completely upset by conditions in another region.

968 - On the Reproduction and Fertility of the Elm Leaf-Beetle (*Galerucella luteola*). — LÉCAILLON, in *Comptes rendus hebdomadaires des séances de l'Académie des Sciences*, 1914, 2nd Half-year, Vol. 159, No. 1, pp. 116-119. Paris, 1914.

The elm leaf-beetle (*Galerucella luteola*) belongs to the Chrysomelidae and occurs in Europe, Algeria and in the United States. Both larvae and adults feed on the leaves of the elm (*Ulmus campestris*), often causing considerable damage to trees in parks and public places. Sometimes the insect is so numerous that only the veins and petioles of the leaves remain and when this happens several years in succession the life of the tree is endangered.

The extraordinary abundance of this insect cannot yet be attributed to the occurrence of two generations in one year, but the writer has observed this year on trees near Toulouse and on laboratory specimens that the period of reproduction extends from the beginning of May until early July. The number of eggs in each cluster on the lower surface of the leaf is very variable; the number laid by one female is much greater than was formerly believed, some females reared in captivity having deposited more than 500 eggs. During the period of reproduction the males and females feed abundantly. In the open the females do not lay all their eggs on the same leaf, or even on the same tree. Further, the larvae of one egg-cluster move to different leaves on reaching a certain size.

(1) See No. 798, B. Aug. 1914.

Winter Precautions against the Pupae of Vine Moths (*Conchylis ambiguella* and *Polychrosis botrana*) in Piedmont (1). — TOPPI, M., in *Rendiconti delle sedute della Reale Accademia dei Lincei, Classe di Scienze fisiche, matematiche e naturali*, 1914, 1st Half-year, Vol. XXIII, Part 12, pp. 981-984. Rome, 1914. The writer gives an account of his observations and researches on control of the hibernating pupae of *Conchylis ambiguella* and *Polychrosis botrana*, carried out on several occasions in the Upper Monferrato (story of Alice Bel Colle), Piedmont, partly in collaboration with F. icelli.

The canes generally used for supporting the vines often have the internode open, thus providing suitable shelters for the larvae seeking pupation. For this reason the tipping of the canes and destruction of the tips is recommended, in addition to the stripping of the stocks, as this is a laborious operation not without danger.

To determine the value of this tipping, it was necessary to know to what extent the larvae use the tips of the canes for pupation. In a badly kept vineyard, 25 vines were stripped during the winter and the tips of the canes were examined: the result was 19 pupae in the canes and 6 in the bark. If this is a general proportion, tipping would prevent emergence of about half the moths, which is not a sufficiently large proportion for a good control; further, the method is laborious.

Better results can be obtained by using artificial shelters, among which the most successful are those described and used by G. Cantoni in Trentino. The method consists in placing cloth bands at the base of the shoots on the two-year-old wood; the larvae pupate in these and are easily destroyed. Where canes are used as supports, they should be tipped, and the bands may be placed on them as well as on the stocks. In a comparative experiment it was found that in this case the stocks were as much used by the hibernating larvae as the canes, or even more so. These measures can be made more effective if the bands containing the pupae are placed in special cages to allow the escape of any Hymenoptera parasites that may be present, but not the moths. Out of 100 cocoons, 10 were attacked by fungi and a few cocoons were empty. If they had been in the open, a certain number of pupae would no doubt have been destroyed by animals, fungi and other causes. Frequently a species of wasp and the larvae of *Malachius bipustulatus* are found in the ends of the canes, and though they are believed to prey on the pupae, their usefulness and voracity must be considered highly doubtful.

The writer remarks on the preponderance of *Polychrosis*, since out of 57 moths mentioned above, 54 were *Polychrosis* and only 3 *Conchylis*. In the catch of molasses traps the number of *Conchylis* was apparently larger, namely 10 to 73 *Polychrosis*; possibly *Conchylis* was abundant locally in the district in which these researches were made.

¹ See also No. 590, B. June 1914.

970 - **The Fumigation of Citrus Trees in Egypt.** — GOUGH, LEWIS, in *The Agricultural Journal of Egypt*, Vol. IV, Part I, pp. 17-19. Cairo, 1914.

After having mentioned that citrus trees in Egypt are subject to the attacks of several species of scale insects (1) among which the most important are *Aspidiotus aonidium* (?), *A. aurantii* and *Icerya purchii*. Dr. Gough describes the system of control which has been adopted and which is carried out only by the Government and which consists in a well known process of fumigation with hydrocyanic acid.

971 - **The Principal Pests of Rice in Indo-China.** — DUPONT, L., in *Journal de culture tropicale* Year 14, No. 157, pp. 204-207. Paris, 1914.

I. INSECTS. — The writer gives some information on the following insects injurious to the rice crop.

a) Lepidoptera. — 1) *Sesamia inferens* Wlk., the young larva which enters the upper portion of the stem and bores their way to the heart where they frequently pupate; the pupae are easily destroyed in great numbers by raising the level of the irrigation water so that they become submerged. A certain number of larvae, however, always ascend the stem to pupate. As many as ten pupae have been found in one stem. This species, already recorded in India, Java, Tonking, etc., caused great damage to the rice crop in the state of Pahang (Federated Malay States) in 1906.

2) *Schoenobia bipunctiferus* Wlk., the larva of which, on leaving the stem, protects itself with a fragment of the leaf until it returns to pupate at the base of the stem; the moth emerges after 10 or 15 days. It has caused great damage in the Philippines and occurs in Java, Tonking, etc.

3) *Cnaphalocrocis medinalis* Gn., is the commonest pest of rice after boring the upper portion of the stem, it gradually works its way to the base. Its presence is indicated by an empty panicle of a bluish appearance, later turning ashy grey or dark grey on the development of saprophytic fungi. The damage due to this insect may vary from 10 to 25 per cent. It is kept in check by cutting the diseased stems as far as possible, soon after the appearance of the panicles, and destroying them without delay, or by ploughing in the stubble immediately after harvest. This species has been recorded in India, Java, and Tonking.

4) *Artona walkeri* Moore; this seems to be the first record of this species as parasitic on rice; in 1911 it caused considerable damage in the province of Thai-Nguyen, and it was recorded in the neighbourhood of Hanoi in 1913.

5) *Sitotroga cerealella* Oliv.

b) Hemiptera. — 1) *Leptocorisa varicornis* Fabr. is widely distributed at all seasons of the year. It sucks the milky contents of the young stems. When they occur in large numbers they may be kept in check by spraying with nets of fairly large mesh. It is also useful to destroy the green

(1) See No. 1485, B. Oct. 1912.

to grow in the neighbourhood of rice fields. *Cicindela sexpunctata* is a very effective and abundant natural enemy of this pest in Tonking.

2) *L. acuta* Thumb., which causes similar damage, is widely spread in the Philippines; in 1909 it caused serious damage to the rice fields in Japan.

II. FUNGI. — Finally the writer mentions two fungi: *Ustilagoidea* (1). *Tilletia horrida* Tak. and *Tilletia horrida* Tak. (1).

The former, restricted to rice, is common in Tonking, the ten-months' rice being most particularly attacked. Near Hanoi as many as 15 diseased panicles have been found on one panicle by the writer. It is most abundant in the fields which are badly cultivated. The infested grain swells and assumes a yellowish-green colour more or less intense according to the development of the disease; it soon becomes a dull green velvety mass covered with spores, from 6 to 10 mm. in size and darkening in colour until it is black, whilst its surface disintegrates and falls to dust: beneath the greenish-black dusty layer of spores there remains a small very hard, yellowish mass with a hard white centre. The fungus is common in Japan, China, etc.

Tilletia horrida also attacks the grains in the panicle, converting them into a black powdery mass of spores. The writer has observed it on ten-months' rice near Hanoi and in the province of Phu-Yen. It is much more common than *U. virens*.

- The Mole Cricket (*Gryllotalpa vulgaris*) damaging Rice Fields in Italy. — NOVELLI, N., in *Il Giornale di Riscultura*, Year IV, No 13, pp. 189-193. Florence, July 25, 1914.

The writer records that the mole cricket occurs in increasing numbers in certain irrigated rice-growing districts in Italy, where the conditions are undoubtedly very favourable to its development.

It causes considerable damage and the writer has seen entire fields almost devastated by the insect. Wheat, oats and barley have been badly injured and maize reduced so as to require re-seeding. Where the crops are drilled the damage was worse, since the crickets follow along the furrows more easily. Close to the banks dividing the rice plots in the previous year, the damage is always complete; wheat or maize following is always greatly thinned and market garden crops are very seriously injured. Dry land rice is attacked similarly to wheat; and in ordinary cultivation they come down from the banks to devour the rice when the water is run off, especially at the first drying. The banks often become infested by these insects that their resistance to water becomes seriously injured, the escaping water giving rise to so-called cold spots below, where the rice remains stunted.

The writer points out the importance of adopting measures against the pest without delay and recommends the following: a) summer cultivation in the irrigated regions, so as to interfere with the development of the insect, and destruction of the nests by children or labourers following

[1] See No. 992, B. March 1911.

the plough: stamping on them is sufficient to destroy the eggs or young larvae; *b*) early ploughing of the leys intended for wheat, maize, et followed by a second ploughing before sowing; *c*) searching for the insects during the irrigation of the fields: as the water rises they leave their burrows and collect on the higher ground, many swimming to the banks, where they can easily be destroyed; *d*) searching for the insects and their nests in the banks, or injection of carbon di-sulphide in holes 8 inches or more deep and 30 inches apart, or watering the banks with 20 per cent. petroleum emulsion: any insects which come out on the surface as a result of these treatments can easily be destroyed under the

973 - Sweet Potato Sphinx (*Herse convolvuli* F.) in Natal. — FAURE, J. C. *The Agricultural Journal of the Union of South Africa*, Vol. VII, No. 4, pp. 515, fig. 1. Pretoria, 1914.

The sweet-potato industry in the New Hanover-Dalton District in Natal has increased rapidly in recent years. There are probably about 2000 acres under sweet potatoes every year, and the gross value of the crop is about £20 000.

In November 1913 reports from the district came in about severe injury to the crop caused by a larva which the writer refers doubtfully to *Herse convolvuli* L. It devours the leaves of the sweet potato, causing a loss which is estimated at from 25 to 50 per cent. and even more. One 17-acre field was severely infested and the whole of it was practically defoliated in the course of a week.

Growers are of opinion that there are three occurrences of the larva every season, one towards the end of November, one in January and one in March. The January infestation seems to be that most feared. At Schroeders in Natal the insect has been known for the past twenty years.

The writer gives the following information on the life-history of the sphinx: the eggs are laid singly on the under sides of the leaves: the larvae show a great variation in colour and markings, the majority, however, being dark brown; pupation takes place in the soil.

From dead larvae Tachinid flies have been reared, as well as a small Chalcid which might be a hyperparasite.

The experiments carried on at Schroeders on a small scale indicate that the sphinx can be readily controlled by the use of arsenical sprays. Paris green gave the best results, but arsenate of lead will probably answer the same purpose. The former was used at the rate of 1 lb. 2 lbs. of lime and 75 gallons of water, and arsenate of lead at the rate of 3 lbs. to 50 gallons. The mixtures were sweetened in both cases. From 30 to 80 per cent. of the larvae were thus killed and besides this the sprayed areas were markedly avoided by migrating larvae. Hand-picking was probably very successful on a small scale, and since the insect hibernates in all probability as a pupa in the soil, thorough winter ploughing and harrowing may destroy many of the pupae and thus aid in the control of the pest. During their migrations the caterpillars might be killed by digging ditches for them to collect in or by the use of poison bait spread across their line of march.

Large Narcissus Fly (*Merodon equestris*) and Small Narcissus Fly (*Eumerus strigatus*) Injurious to Bulbs in Great Britain and Ireland.—

Board of Agriculture and Fisheries, Leaflet, No. 286, pp. 1-7, 1 plate. London, 1914.

Of the various animal pests attacking the bulbs of Narcissi and related plants, none are more injurious than the two Narcissus flies, *Merodon equestris* F. and *Eumerus strigatus* Flu. The former, often known as Large Narcissus Fly has been known in England since 1869, and is now widely distributed in England and Wales, while it also occurs in many parts of Scotland and in Ireland. It is generally supposed to have been brought to England, probably from Holland, but in the opinion of some it is considered to be native.

The systematic description of the insect is given in the leaflet together with its life history.

The bulbs attacked include the Narcissus, Hyacinth, Tulips (rarely), Scyllis, Habranthus, Vallota, Galtonia, Scylla and Leucojum. As regards Narcissus, it has been observed that the hard bulbs of the *N. maxima* and *N. spurius* type are least attacked, while the most susceptible are the *N. poeticus* and *N. Leedsii* varieties, and, further, that varieties with covered cups are more susceptible than those without.

The interior of the bulbs is hollowed out, a wet mass of frass and decayed matter only remaining. The decay due to *Merodon*, however, is not cause such a complete breakdown of the bulb as in the case of attack by *Eumerus*.

When the larvae are large the infested bulbs can be detected by gently squeezing near the neck with the fingers: sound bulbs being hard, and infested ones less resistant. When the larvae are young, it is much more difficult to be sure of their presence, but it is said that any bulb in which the basal ring is incomplete or damaged should be regarded with suspicion. When a number of bulbs in a row fail to appear in the spring, those which have missed should be searched for and destroyed. Bulbs should be dug in summer and all found to be infected should be destroyed. Bulbs may be steeped in water for from 24 to 48 hours. The water should be warm, and if possible should not be allowed to become very cold in order not to injure the bulbs. The steeping seems to make the bulbs so that the larvae are forced out or drowned, though they can live many days when immersed. This treatment has been found very effective. Netting the flies with a butterfly net has been found quite successful in gardens.

The Small Narcissus Fly (*Eumerus strigatus*) has been only recently recognized as seriously injurious to Narcissi; it attacks also Hyacinths, Onions and Shallots (the two latter only on the Continent).

The systematic description of this insect, as well as its life-history, which has not yet been completely traced, are given in the leaflet.

In an advanced stage of the attack the interior of the bulb is entirely decayed and is full of a semi-liquid decaying mass. The attack seems to begin at the neck, and in mild cases the larvae are found in the neck or between the scales at one side. The presence of many larvae and the complete

decay produced distinguish the damage done by *Eumerus* from that done by *Merodon*.

The destruction of affected bulbs when lifting is obviously indicated and since the decay produced is rapid there is little difficulty in recognizing them. Early lifting also seems desirable to destroy the larvae before the emergence of the second brood.

The larvae of several other flies are frequently found in bulbs decaying from other causes, but they do not appear ever to start an attack on a healthy bulb. The commonest species are *Lonchaea chorea* and species of *Scatopse* and *Sciara*.

